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ABSTRACT

A major applied research project evaluated the effectiveness of a novel course, Offshore Survival Systems Training. The major course outcome that was evaluated was the increase in frequency with which offshore personnel correctly launched the covered powered survival craft on offshore drilling rigs. The evaluation methodology included the 628 written and performance pretest and posttest records of course graduates as well as 231 written and 63 performance retest scores gathered by supervisors on offshore installations. This method replaced the conventional, but costly evaluation of marine survival training by inquiry into casualties. The mean written posttest score was 95.07, and 100 percent of the students successfully launched the survival craft. At least three months after the training, the company-wide percentage of those who could still launch the craft was 77.8 percent. The mean written retest score was 88.01. The per capita cost of the course was $241, or excluding travel and per diem expenses, $71. The increase in successful launches from 10 to 77.8 percent and the increase in knowledge of marine survival from 50.28 to 88.01 were concrete benefits. Recommendations were that (1) all new employees should undergo this training and (2) the selection criteria for employee retention should include the posttest scores. A 69-item bibliography is included. The appendices provide the written retest and the instructions for the performance and the written retests. (YLB)

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A SYSTEMATIC CASE STUDY OF THE COURSE, OFFSHORE SURVIVAL SYSTEMS TRAINING, TO IMPROVE THE PRACTICE OF MARINE SURVIVAL TRAINING.

by

Franco Zambon

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A Major Applied Research Project presented in partial fulfillment of the requirements for the degree of Doctor of Education

Nova University

September, 1988

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Abstract of a Major Applied Research Project Presented
to Nova University in Partial Fulfillment of the
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September, 1988

The purpose of this major applied research project was to evaluate the effectiveness of a novel course, Offshore Survival Systems Training. The major outcome of this course was the frequency with which offshore drilling personnel correctly launched their covered powered survival craft. The problem was that conventional evaluation of marine survival training had been by inquiry into casualties, a costly evaluative method.

The evaluation used the 628 written and performance pre-test and post-test records of its graduates. The class attendance sheets contained the necessary data. Each sheet listed the participant's installation, his written and performance pre-test and post-test scores, and his dates of the attendance. The evaluation used 231 written and 63 performance re-test scores gathered by supervisors

on offshore installations. The supervisors had previous practice administering multiple choice, written tests through their administration of the company's quarterly supplemental assignments. The supervisors completed a checklist to assess the performance of selected crewmen. The training department randomly selected 63 graduates to undergo performance re-tests. Telephoning the administrators of the performance checklists confirmed their results. Yard and office personnel refined the instructions for completing the checklist. The re-tested graduates were told that their assessments would reflect only on the course and not upon them individually. The evaluation used the cost data for the course collected by the company for lodging, board, transportation, faculty and trainee salaries, and leasing expenses. The training department's computer and its original documents contained the data for the evaluation.

The evaluation used methods adaptable to most providers of offshore survival training. It answered the following, broad research questions -- results derived from written tests were cited at the 95 percent level of confidence. (1) How well were the learning objectives achieved? The mean written post-test score was $95.07 \pm .59$, and 100 percent of the students successfully launched the survival craft. (2) How was learning used on the job, and how did it improve performance? At least three months after the training, the company-wide percent of those who

could still launch the survival craft was 77.8 percent. The mean written re-test score was 88.01±1.46. (3) How effective was the monetary investment in training? The per capita cost of the course was $241, or excluding travel and per diem expenses, $71. The increase in successful launches from ten percent to 77.8 percent and the increase in knowledge of marine survival from 50.28±1.69 to 88.01±1.46 were concrete benefits.

Recommendations were made. Every new employee should undergo Offshore Survival Systems Training. The selection criteria for the retention of employees should include the post-test scores. The course should provide the training department feedback. Every Coast Guard approved course in survival craft training should have a follow-up component. The graduates' assessments should recur every three months. Alternatively, graduates who were unable to launch their craft should undergo the course again. The results of this study should be disseminated to the United States Coast Guard, the Marine Survival School Steering Committee, the Sales, Training, and Safety Departments of Diamond M Company, as well as the International Association of Drilling Contractors. Thus, the results of the evaluation should reach the clients of the company. Additionally, a course should be developed to teach supervisors how to train and evaluate their subordinates in marine survival. Finally, the evaluation should be submitted to the Educational Research Information Center for publication.

The Human Resources Department of the company will determine the logistical and budgetary requirements for the recommendations made in the evaluation. The practical design for the safe evaluation of marine survival training, course feedback, and recommendations improved the practice of education in the offshore oilfield.

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Chapter 1

INTRODUCTION

The purpose of this major applied research project was to evaluate the effectiveness of a novel course, Offshore Survival Systems Training. The major outcome of the course that was to be evaluated was the increase in the frequency with which offshore personnel correctly launched the covered powered survival craft. To be directive of future steps, however, this evaluation incorporated the examination of additional auxiliary outcomes.

Paralleling the definition of Jedamus, et al. (1980), the evaluation was operationally defined as the process of specifying, defining, collecting, and interpreting information about designated outcomes of a program and using that information to make decisions among alternatives about the installation, continuation, modification, or termination of a program. Although there were many kinds of evaluations, Knox (1986:167) had noted that

> The core of an evaluation plan is the design and the procedures for data collection and analysis. Typically ... data are collected from representative samples of participants, instructors, administrators, and records in ways that minimize disruption of the ongoing program and encourage the use of findings.

The problem was that this pertinent evaluation of survival systems training, especially of offshore training with the covered powered survival craft, rarely if ever occurred,

either on shore or offshore (Christman, 1985; Commandant, United States Coast Guard, 1985). The pertinent evaluation of the survival training involved the examination of the results of the training.

Since 1973, Roueche and Herrscher have written about the necessity of feedback of results in the evaluation of a course. In fact, they listed post-testing as a means of assessing teaching, not just learning. Their goal was to improve the practice of education in a systematic manner (Roueche and Herrscher, 1973). One means to improve the practice of education was to produce evaluative feedback for a course. A procedure to evaluate the outcomes of marine safety training would have improved the currently inefficient process of evaluating the training.

Typically, offshore training had been evaluated only by the assessment of "inputs" into each course or by an inquiry into a casualty. Actually, the evaluation of training "outcomes" occurred only after some grisly and expensive marine casualty and during the subsequent investigation by a marine board of inquiry. The major applied research project was an initial attempt to infer the effectiveness and the deficiencies of the course, Offshore Survival Systems Training.

Experts had recently called for the safe evaluation of training courses (McTaggart, 1986; Major, 1986; Jones, 1986; Christman, 1985). The pertinent evaluation of Offshore Survival Systems Training consisted of what

Brinkerhoff (1987) termed stage IV, V, and VI evaluations. These stages measured how well learning objectives were achieved, evaluated how well learning was used on the job and improved performance, and determined what value was returned to the organization. Brinkerhoff's previous stages of evaluation were considered to be irrelevant to the present investigation since the equivalents of those stages had been reported elsewhere (Zambon, 1986a). The first three stages evaluated the goal setting and the needs analysis, the program design, and the implementation and the operation of the course. The elements pertinent to this research project, however, consisted of stage IV, V, and VI evaluations of Offshore Survival Systems Training. This systematic case study focused on these latter stages.

Background and Significance

Experts had recently called for the safe evaluation of training courses (McTaggart, 1986; Major, 1986; Jones, 1986; Christman, 1985). They were dissatisfied with the then current system of evaluating courses, which could be termed evaluation-by-casualty. The history of this procedure was one of repeated failure although the failure could not be assigned to the investigating agencies. An illustration follows.

The United States Coast Guard had cited some combination of three notable marine casualties to justify its repeated promulgation of regulations about marine

survival training for offshore oilfield workers. It had cited the Ocean Express casualty (United States Coast Guard, 1976), the Ocean Ranger casualty (United States Coast Guard, 1983), or the Java Sea casualty (United States Coast Guard, 1986a). The regulations had emerged from the studies of marine boards of inquiry. After each casualty, a marine board of inquiry had investigated the incident to infer its cause. Thereby, it had repeatedly drawn conclusions about how the training of offshore crewmen could be improved. Thus, the United States Coast Guard in effect evaluated training by an ex-post-facto analysis of each casualty. This evaluative method was too costly in lives and in money. The crews' training should have been safely evaluated for its effectiveness before each tragedy.

Offshore Survival Systems Training had been designed to comply with the latest recommendations and regulations of the experts in marine survival training (Zambon, 1986a). Likewise, the University of Southwestern Louisiana was currently attempting to produce a similar course for a consortium of twenty oilfield related companies (Grove, 1986). The content of offshore survival training was hardening without its being tested for efficacy. Furthermore, a requirement for a shore-based course removed the responsibility of training from the person in charge of the crew. Therefore, the requirement for such a course violated the principle and tradition that the supervisor was the natural trainer of his crew (Argyle, 1975). It

could also confuse lines of authority (Nadler, 1987). At this juncture, shore-based survival systems training seemed an imminent but once again untested requirement for the inducement of successful offshore training drills. The latest and only United States Coast Guard approved course should have had its outcomes safely evaluated. Diamond M Company possessed this unique course.

The interested audience for the evaluation of Offshore Survival Systems Training comprised the United States Coast Guard, the International Association of Drilling Contractors, The American Petroleum Institute, the Marine Survival Training Center Steering Committee of the University of Southwestern Louisiana, the clients of the evaluated company as well as its sales, risk management, safety, and training departments.

Such an evaluation of shore-based offshore survival systems training could and should have occurred at Diamond M Company since it had the only United States Coast Guard approved course (Commandant, United States Coast Guard, 1986) designed to meet the prospective licensing requirements for officers and operators of mobile offshore drilling units (MODUS) (United States Coast Guard, 1985).

In Offshore Survival Systems Training the trainees were taught to train repeatedly. They learned to reach objectives under conditions resembling emergency conditions. To train under hazard would have been foolish. Anyone who would have failed the pre-test could

not have trained for the post-test since he would have been dead. Offshore Survival Systems Training instructed individuals to successfully launch their covered powered survival craft under training conditions.

The Course Offshore Survival Systems Training

In 1984, Diamond M Company developed the course, Offshore Survival Systems Training. The development and design of this course followed the advice of expert individuals and organizations (Zambon, 1986a). Because of the quality and consistency of the "inputs" into the course, the United States Coast Guard granted it approved status (Commandant, United States Coast Guard, 1986) on January 1, 1986. The evaluation of a course by the United States Coast Guard involved an examination of the quality of inputs and of the consistency of the implementation with the instructional plan (United States Coast Guard, 1986b). The consistency had been examined on site.

Offshore Survival Systems Training had several goals. Perhaps its most important goal was to prepare its graduates with the knowledge, skills, and attitudes to increase their frequency of training with their covered powered survival craft aboard their rigs. Toward this end the written pre and post-tests were criterion referenced tests containing the same items but in a different order. This tested knowledge should have lead the participants to conclude that the covered powered survival craft was the

most important means by which to abandon a rig (Hopkins, 1987). Such arrangements of items should not have affected the participants' selection of alternatives (Powers, Morrow, Goudy, and Keith, 1977). In any case, small scale testing at the training center indicated equivalence of forms. The hands on pre and post-tests consisted of launching a covered powered survival craft as directed by its manual.

The launching of the covered powered survival craft consisted of discrete, highly identifiable actions. The training manuals of the craft listed these actions both in words and in drawings. These descriptions were also glued to the inside of each covered powered survival craft - an often overlooked aid. What constituted each action could not be in doubt. The covered powered survival craft had been designed to require simple actions, simple actions such as those required to reconstruct an interlocking Chinese puzzle.

To the uninitiated, the art of launching a covered powered survival craft was a unique experience. It compared to the following consecutive episodes: preparing for a parachute jump; starting a motor boat in a raised elevator; operating a winch from inside its pendulous load: disengaging from a crane from inside its cargo; and driving a sealed roller coaster only by compass heading. All this ignored the deployment of the compressed air within the craft and a water spray outside the craft. The

minimal steps included: donning a hard hat and life vest, starting the engine, lowering the craft, disengaging it from the hoisting line, and steering away by compass heading. To the uninitiated, the art of launching a covered powered survival craft was a novel experience.

The course trained its participants on two kinds of survival craft. The engineering department had furnished the instructors with a list of the kinds of survival craft on the company's offshore installations. One or the other of these craft resembled the craft on a particular installation although the resemblance was not identical. The similarity of the craft to those on offshore installations was good enough to allow the United States Coast Guard to substitute this training for the practical part of the lifeboatman's examination which was usually performed with the craft aboard the installation of the candidate. The covered powered survival craft could rescue personnel in situations too risky for other means of rescue. It was the preferred means of evacuating a rig in an emergency (Hopkins, 1987).

Whole crews had been sent to the training center for training, usually one at a time. Each offshore installation had sent four crews: a day crew, a night crew, and two off crews to relieve the first two crews. Crews were selected for training on the basis of their being off when the training center was available. To train every man in the company, Offshore Survival Systems Training had

taken the period of time from January 1, 1985 to June 16, 1987. This time period should be noted. Within this period, 55 classes had been held. The time constraints usually had limited each class to one crew, eighteen to twenty-eight individuals. The training always had lasted for two days. Eventually, 636 participants were graduated, and only two failed the written post-test. Every crew on every rig of the company had undergone training in Offshore Survival Systems Training by June 16, 1987. This date will be needed later.

To encourage the retention of the knowledge imparted by the course, the graduates received quarterly, supplemental assignments in the form of a list of questions. These questions covered weaknesses that the previous assignments had revealed. Some of these questions always dealt with the covered powered survival craft. Such questions were intended to lead the graduate to repeatedly contrast the advantages of the covered powered survival craft to the other means of offshore survival. Thus, the knowledge imparted by the course was intended to guide the graduates to train with the covered powered survival craft. In addition, the evaluation should have determined whether or not Offshore Survival Systems Training caused (1) a large change in the knowledge that should guide the graduates to training with the covered powered survival craft and (2) a large change in the launching skills of the participants. This would be a stage IV evaluation

(Brinkerhoff, 1987). The written and performance pre and post-test scores of the participants would allow the inference of whether or not Offshore Survival Systems Training achieved these changes.

If Offshore Survival Systems Training had caused an increase in the achievement of the participants, then the next step would be to see whether the announcement of formal training along with the availability of Offshore Survival Systems Training manuals would result in an increase of achievement before formal training began. In fact, a previous study had shown that such a contingency induced an increase in written pre-test scores (Zambon, 1987). The written and performance pre-test scores from the initial contingents from the offshore installations and the written and performance pre-test scores from the subsequent contingents from each installation allowed the testing of this contingency.

A stage V evaluation determines the effect of moving the learned behavior from the training situation to the job and the effect of time on the retention of the graduates' acquired knowledge and skills. The comparison of the ratio of crewmen who could then launch a covered powered survival craft with the ratio of personnel who could do so during the performance pre-test should indicate the amount of transference of learning to the job. Yet, a poor transference could have occurred, and such would require an explanation. Consequently, the assessment of each

individual's overall ability to launch his survival craft had depended on his performance on each of the component behaviors involved in a launch. A checklist of the specific behaviors necessary for each individual to launch was easily composed from the launching steps published by the manufacturers of the survival craft. Thereby, the flaws in the transference could be traced. Furthermore, the knowledge that was intended to guide the personnel to train might have been forgotten. A readministration of the written pre-test could identify which important facts were forgotten. This was the kind of data necessary for a stage V evaluation.

A stage VI evaluation determines the value the training returned to the organization. The cost of providing the course to the personnel of the company can be easily calculated from the administrative data the company maintained on the computer system of the training center. The return on the investment would be considerable if the cost was below the figure ($750) published by the United States Coast Guard (1985).

Research Questions

Stage V and VI evaluations presupposed that significant changes have occurred as measured via the stage IV evaluations. Thus, in order to obtain a comprehensive evaluation according to Brinkerhoff's model (1987), each stage would need to be addressed.

Succinctly, a stage IV evaluation (Brinkerhoff, 1987) would serve to do the following:

1. To demonstrate the efficacy of the program, as well as to make revisions to it. Practitioners needed to know what worked and what did not;

2. To determine changes in skills, knowledge, or attitudes that resulted from a program which were not intended in the first place;

3. To determine which trainees achieved which learning results;

4. To plan for the transference of learning;

5. To plan for follow-up evaluation; and

6. To gather data for marketing claims.

The following specific research questions were designed to structure the stage IV inquiry of this Major Applied Research Project.

1. Did the company-wide percent of personnel who were able to launch the covered powered survival craft but who were untrained increase during the period of Offshore Survival Systems Training from January 1, 1985 to June 16, 1987?

2. Did the written pre-test scores increase over the period from January 1, 1985 to June 16, 1987?

3. Did the course teach the crewmen anything, that is, was the mean of the differences between the written pre-test scores and the post-test scores significantly different from zero?

4. During the period January 1, 1985 to June 16, 1987, did Offshore Survival Systems Training produce an increase in the percent of those who could launch the covered powered survival craft during their post-tests from the percent of those who could launch their covered powered survival craft during their pre-tests?

5. Did the provision of manuals coupled with the announcement of eventual training result in an increase of the participants' knowledge of safety before these employees received formal training?

6. During the period from January 1, 1985 to June 16, 1987, did the announcement of eventual formal training along with the provision of manuals produce an increase in the launching pre-test scores?

In brief, a stage V evaluation (Brinkerhoff, 1987) would serve to do the following:

1. To discover the hits and misses of the transfer of training so that if needed the guided revision of the program may occur;

2. To plan how to support increased transfer of training;

3. To plan stage VI evaluation; and

4. To document and account for transfer of training.

Information for the on-going program could allow certain claims about the program, and it could allow future research into human resource development and results.

The specific stage V research questions follow:

7. Did the graduates take more knowledge about marine safety to the job than they did before the course, that is, what was the mean of the differences between the re-test scores and the original pre-test scores?

8. Was the mean difference between the written pre-test scores and the written re-test scores still significantly different from zero?

9. How much learning was transferred to the job; that is, was the mean difference between the written post-test scores and the written re-test scores still significantly different from zero?

10. Which facts had been forgotten most often?

11. How many graduates made their mistakes at each part of the launch?

12. What percent of the graduates retained their abilities to launch a covered powered survival craft?

13. Was the percent who could (i.e. after the post-test) launch a covered powered survival craft significantly greater that the percentage found through the pre-tests? This was the second most important question of the evaluation.

14. Was the percent who could (i.e., long after the post-tests) launch a covered powered survival craft significantly greater than the percent found through the post-tests?

A stage VI evaluation (Brinkerhoff, 1987) would determine the value the course returned to the

organization. The United States Coast Guard had performed a stage VI analysis previously. Training costs for lifeboat and survival suit training was estimated to cost between $120 to $750 per student with an average cost of $175 per student. At this rate, training in offshore survival represented an attractive investment. In fact, just about everyone involved had reacted favorably to this requirement (United States Coast Guard, 1985:19).

> The training and qualifications contained in the proposal, which are strongly recommended by the National Transportation Safety Board, generally supported by industry and under serious consideration internationally, will certainly be justified if they contribute to the prevention of the loss of even one MODU and its crew, or even minimize the down-time of a operating unit.

However, in the final analysis, this stage VI evaluation would be favorable only if two conditions were to occur: (1) Offshore Survival Systems Training really worked and (2) its cost was below $750 per student. Whether or not Offshore Survival Systems Training fulfilled these conditions had not been determined prior to the analyses undertaken via this major applied research project.

The specific stage VI research question follows:

15. Was the cost per graduate below $750 per student?

Hypotheses

Null hypotheses were formulated for research questions numbered one, two, three, four, five, six, eight, nine, thirteen, and fourteen; these required statistical tests. Only the research hypotheses were entered in the places

that did not require null hypotheses, i.e., questions numbered seven, ten, eleven, twelve, and fifteen.

1. "The percent of untrained individuals who could launch their covered powered survival craft during the fore part of Offshore Survival Systems Training was the same as the percent of untrained individuals who could launch their covered powered survival craft during the latter part of Offshore Survival Systems Training."

2. "The mean of the of the pre-test scores taken from the fore part of the course was the same as the mean of the pre-test scores taken from the latter part of the course."

3. "The mean of the differences between the written pre-test scores and the post-test scores was zero."

4. "The percent of participants who could launch their covered powered survival craft during the practical post-tests of Offshore Survival Systems Training was the same as the percent who could launch during the practical pre-tests of Offshore Survival Systems Training."

5. "There is no significant difference between the pre-test mean of the personnel having manuals and the pre-test mean of the personnel lacking manuals before formal training."

6. "The pre-test rate of launching of the initial contingents from the installations was equal to the pre-test rate of launching from the subsequent contingents from the same installations."

7. For the purpose of continuity the research question is presented here.

"Did the graduates take more knowledge about marine safety to the job than they did before the course?"

8. "The mean of the differences between the pre-test and re-test scores was zero."

9. "The mean of the differences between the post-test and re-test scores was zero."

10. For the purpose of continuity the research question has been presented here.

"Which facts had been forgotten most often?".

11. For the purpose of continuity the research question has been presented here.

"How many graduates made their mistakes at each step of the launch during the re-tests?"

12. For the purpose of continuity the research question is presented here.

"What percent of the graduates retained their abilities to launch a covered powered survival craft?"

13. "The percent of those who could launch a covered powered survival craft during the re-tests was the same as the percent of those who could launch a covered powered survival craft during the pre-tests."

14. "The percent of the graduates who could launch a covered powered survival craft during the re-tests was the same as the percent of those who could launch a covered powered survival craft during the post-tests."

15. The research question asked, "Was the cost per graduate below $750 per student?"

Definition of Terms

A plan for the evaluation of the efficacy of an offshore survival course of necessity would use terms peculiar to education or sailing. Some of the most specific terms, as these were used in the major applied research project, are explained below.

1. Stage IV evaluation (Brinkerhoff, 1987) determined the extent to which the skills, knowledge, or attitudes have been imparted to the participants.

2. Stage V evaluation (Brinkerhoff, 1987) determined the extent to which acquired skills, knowledge, or attitudes were being transferred to the job.

3. Stage VI evaluation determined what value had been returned to the organization and, considering the costs of the program, that the value was worth the expense.

4. Inputs were the products, services, equipment, and other constituents of the student's environment that were intended to cause learning. These included faculty, physical facilities, textbooks, finances, and the like.

5. Outcomes were the long term results of instruction and learning, such as, achievements of graduates.

6. Evaluation was the process of specifying, defining, collecting, analyzing, and interpreting information about designated aspects of a program and using that information to arrive at a value judgement among alternatives of the installation, continuation, modification, or termination of a program.

7. The employees who worked on offshore drilling units were designated offshore personnel.

8. A group of personnel scheduled to work together were designated a crew; a crew worked on an installation far from shore.

9. A rig was an offshore installation used to drill for oil or gas. In the major applied research project, it was also referred to as a mobile offshore drilling unit.

10. A covered powered survival craft was defined as any enclosed, rigid, powered vessel that was stored on an offshore installation and used to quickly remove men from the installation. Usually, these craft temporarily provided an internal pressure greater than atmospheric pressure. All such craft could cool themselves by sprinkling water over their shells. Furthermore, late model craft had to be self-righting; older craft had to have only impressive stability.

11. The written re-test was a second administration and a completion of a criterion referenced pre-test.

12. The performance re-test was the behavioral response to the signal to abandon the offshore installation.

Limitations of the Study

The individuals who contributed scores for this study were drawn from the employees of Diamond M Company, an international offshore drilling contractor. Their scores

were used to calculate the means, ranks, and ratios used in this study. The inferences from the evaluation were to apply only to oilfield personnel working on offshore installations. Specifically, the subjects of this research were the employees of a drilling contractor.

The analyses for questions one, two, five, and six referred to the population of the company. Similar analyses using only the individuals who had remained with the company until 1987 were also to occur. Subsequent questions about the current performance of the company's personnel required such additional analyses. These additional analyses restricted their allowable conclusions to those inferences that had to do with individuals who remain with the company. The analyses for questions numbered seven, eight, nine, ten, eleven, twelve, thirteen, and fourteen allowed conclusions only about personnel who remained with the company. The analyses of questions five and six imposed the following limitations on their allowable conclusions. The training department needed to know whether or not learning would endure or occur despite the effects of the intervening variables, that is, despite the situation aboard the installations.

1. This study placed only reading material on the offshore installations.

2. Some variables might have remained uncontrolled. Yet, discovering whether or not these variables affected the learning of the personnel was important. The training

department needed to know whether or not learning would endure or occur despite the effects of the intervening variables, that is, despite the unique situations aboard the installations.

Assumptions

The evaluation of Offshore Survival Systems Training proceeded under several assumptions.

1. Presumably, the passage of time had not affected the actions of the instructors or of their subjects during the delivery of the course.

2. It was important that no member of the training department had asked a prospective trainee to study before the trainee's attendance of formal training.

3. Given a behavioral checklist, a supervisor could assess the launching behavior of his subordinates.

4. The behaviors for launching the craft that was closest in design to the trainee's during formal training were similar to behaviors for launching the craft the trainee's offshore installation.

5. The personnel had been randomly assigned to treatment and control groups.

6. The criteria for selecting a pool of employees to recall to work when possible during austere times had been consistently applied.

7. The actual selection of individuals from the pool of personnel to be recalled for employment was a random

selection. No change in the selection process had occurred during the period of the evaluation.

The Summary

In summary, meeting just the regulatory laws about offshore survival training failed to provide offshore workers with adequate safety. Worse, the current system of evaluating training outcomes by inquiry into casualties failed to adequately evaluate training. The adequate safety of crewmen in any abandonment was assured by their training with the covered powered survival craft. Yet, their natural trainer, their supervisor, neglected his training duties for any combination of reasons. These reasons included ignorance of, distraction from, or improper attitude towards survival tactics. To adequately train offshore crewmen to train with their covered powered survival craft, Diamond M Company had developed and presented the course, Offshore Survival Systems Training. Offshore Survival Systems Training contained the latest, conventional wisdom about survival training.

Stage IV and stage V evaluations (Brinkerhoff, 1987) assessed how well the objectives were achieved at the end of the course and how learning was used on the job. Specifically, stage VI evaluation was the final phase of course evaluation: The determination of the return of value to the organization was stage VI evaluation. Yet, even stage VI evaluation depended on stage IV and V

evaluations. Furthermore, evaluation had to continue for as long as crewmen were to work offshore.

The answer to what Offshore Survival Systems Training did was as important as the determination of a workable process of evaluation. Interestingly, the supervisor was a reliable source of part of the data for the evaluation (Jones, 1986). Thus, he could retain his historic position as the educator of his crew. To compare the skills of the personnel before training to their skills after training, the evaluation used a single-group, pre-test and post-test design (Cook and Mark, 1984), a design adaptable to evaluation under oil field schedules.

The audience for this course included the United States Coast Guard, the International Association of Drilling Contractors, The American Petroleum Institute, the Offshore Survival Training Steering Subcommittee of University of Southwestern Louisiana, the clients of the evaluated company as well as its sales, risk management, safety and training departments.

Chapter 2

REVIEW OF THE RELATED LITERATURE

The purpose of this major applied research project (MARP) was to evaluate the effectiveness of a novel course, Offshore Survival Systems Training. The major outcome of the course was the increase in the frequency with which offshore personnel correctly launched the covered powered survival craft. To be directive of future steps, however, this evaluation incorporated the examination of additional auxiliary outcomes. The examination of all the resultant outcomes was intended to validate or improve the course.

The Place of Offshore Survival Systems Training in the History of the Improvement of Survival Training

Hopkins (1987) had formally determined that the survival craft was the only safe means of abandoning an offshore installation in every one of the often met hazardous conditions offshore. Frequent training with the craft had always been considered important by maritime bodies. Yet, the marine casualty report for the Ocean Express (United States Coast Guard, 1976:85) concluded that

> Training and drills pertaining to abandonment of the Ocean Express and the use of lifesaving appliances and equipment were inadequate. This resulted in the crew being unfamiliar with the operation of lifesaving equipment, emergency procedures and lack of knowledge as to the availability of certain emergency equipment within the capsule.

Years later a Marine Board again came to the same conclusion about the lack of training on offshore installations, also called MODU's. In the Marine Casualty Report for the Ocean Ranger (United States Coast Guard, 1983:139) the Marine Board concluded that

> The toolpusher's responsibilities included such things as conducting fire and boat drills and insuring the required lifeboatmen were on board and assigned to lifeboats. Though toolpushers were well trained in the drilling operations aspects of a MODU there was no indication they were familiar with or trained in the coast guard regulations or the marine aspects of the rig in order to properly discharge their duties as a "Person in Charge."

The Java Sea casualty brought the situation with training to a head. The Marine Board of Inquiry (United States Coast Guard, 1986a:63) officially stated that

> The Marine Board feels that a suitable alternative to shipboard drills is needed. Schools or training programs should be established to train lifeboatmen. They could be formal schools or company training programs approved by the coast guard.
>
> Further, greater emphasis should be put on ensuring that all crewmembers, not just lifeboatmen, are intimately familiar with their abandon ship duties and the procedures for boarding, lowering, and releasing lifeboats.

Important publications later related evidence that training with the covered powered survival craft still was often neglected on offshore installations. For example, the Marine Safety Council (Commandant, United States Coast Guard, 1985:195-197) published an article that asserted

> Altogether, the search for oil has saddled the toolpusher with a list of responsibilities like no other in any of the world's industries.
>
> Now add to this busy scene the Coast Guard, with its reminders for the toolpusher to attend to both the safety training of all persons on the rig and to the

> lifesaving equipment they would use in an emergency. Unfortunately, this call for attention - backed up as it is by rules in the Code of Federal Regulations - adds more tasks for the toolpusher, who does not lack things to do.... Clearly, the effort of drilling for oil pushes lifesaving equipment to a lower level of interest.

Frequent training could even prevent the neglect of lifesaving equipment (Wahle, 1984). Wahle, the Acting Chief, Survival Systems Branch, Merchant Vessel Inspection Division, said that training revealed the problems with the equipment, and that these revelations usually led the crewmen to repair the problems. Frequent training drills prepared the personnel and the equipment for an emergency abandonment of an offshore installation.

Prospective regulations (United States Coast Guard, 1985) would require the training of supervisory offshore personnel in the use of survival craft. These prospective training regulations had induced Diamond M Company to produce a shore-based course on offshore survival emphasizing the covered powered survival craft. Yet, this solution to the training problem had possible flaws. Some example of the possible flaws follow.

All along, the proposal espoused the training of personnel through an United States Coast Guard approved course. Yet, an approved course meant shore-based training (United States Coast Guard, 1986b), a break with tradition. For an approved course, the United States Code of Federal Regulations, Title 46, subpart 10.30 required a description of the facility. The course had to "have a modern and well

maintained facility that accommodates the students in a safe and comfortable environment conducive to learning." Nevertheless, a shore-based course was at variance with traditional practice.

Usually, the master of the vessel had been solely responsible for the training of his crew. For example, the United States Code of Federal Regulations Title 46 subpart 109.215 stated that

> The master or person in charge shall conduct a boat drill at least once each week, and shall insure that-
> (a) all personnel ... demonstrate their ability to perform the duties assigned to them in the station bill....
> (d) Each person not assigned duties in the station bill is instructed in the use of life preservers.

Aside from tradition, the psychology of interpersonal relations prescribed the role of trainer to the supervisor. For instance, Argyle (1975:211) had asserted that

> It is essential that supervisors should really supervise instructing and training subordinates in how to do their work, checking and correcting the work that has been done, giving subordinates feedback on how well they are doing.

The trend away from relying solely on the master of the vessel to act as a trainer began with some of the conclusions reached after the inquiry into the Java Sea Casualty. The Marine Board of Inquiry (United States Coast Guard, 1986a:63) officially stated that shore-based, formal or company schools should train everyone on an offshore installation how to abandon his vessel.

This rational conclusion of the marine board inspired the eventually promulgated regulations about requiring

approved survival craft courses. Nevertheless, the rationally derived conclusion about the effectiveness of shore-based courses had not been experimentally verified. The managerial complications imposed by shore-based training might outweigh its benefits. The early evaluation of the effectiveness of shore-based survival craft training could influence subsequent recommendations about whether or not a prospective marine course should be shore-based. For example, the University of Southwestern Louisiana needed to know the value such a course would return to its clients. It was attempting to create a course for survival craft training (Grove, 1986). The university needed to know whether or not a shore-based course could actually improve the crewmen's retention of the skills needed to quickly abandon their installations to make its plans. On these grounds, the evaluation of Offshore Survival Systems Training was important.

One variable that had frustrated the long-term success of many courses had been the lack of follow-up after a successful instruction in a classroom. From their experiences in training and organizational development, Blanchard and Lorber (1984) gathered that most companies concentrate on trying to find the next new management concept and never follow-up what they just taught their people. This suggested that the evaluation of the course was a necessary sequential step. Without evaluation, the company might have continued to allocate resources

indiscriminantly, instead of possibly correcting or terminating the course. Yet, if a course had been useful the company should have determined how useful it was. Such information is useful in the marketing of a company's services (Brinkerhoff, 1987), and such information is vital to any organization that wants to know if a course works or not.

Offshore Survival Systems Training was an answer to calls for improved survival training in the offshore oilfield. Whether or not it was effective was an unsettled question. Previous reliance on prescribed solutions lead to perhaps improved training but nevertheless insufficient training. In the natural course of course development, evaluation was a necessary step. Yet, evaluation had been overlooked. The purpose of this MARP was to safely evaluate an important outcome of the course, Offshore Survival Systems Training.

Kinds of Evaluation in the Offshore Oilfield

Initially, the formal evaluations of marine survival training conducted by the organizations in the offshore drilling enterprise involved only the evaluations of inputs (United States Coast Guard, 1986b). Then, the need for effective training induced a call for the assessment of an ever growing number of aspects of training and eventually the evaluation of outcomes, specifically, behavioral outcomes (McTaggart, 1986).

Inputs

In the oil and gas drilling industry, federally required courses had their constituent parts, or inputs, evaluated, but not their outcomes (United States Coast Guard, 1986b). The United States Code of Federal Regulations, Title 46, subpart 10.30 required the on site and repeated assessments of the curriculum, the instructors, the need analysis, the facility, the instructional aids, the examinations, and the record keeping, for an approved course. Educational inputs of high quality were necessary but sometimes were insufficient to produce the desired outcomes Craven (1980).

Outcomes

For a long time, evaluation of outcomes in the offshore drilling industry had consisted of the investigations and recommendations of marine boards of inquiry investigating marine casualties. For instance, the United States Coast Guard adduced the evidence from some combination of three of its completed inquiries as motivation for its repeated promulgation of regulations about the training of owners and operators of mobile offshore drilling units (United States Coast Guard, 1985). These inquiries involved the Ocean Express, the Ocean Ranger, and the Java Sea. Such evaluations were too costly in lives and equipment. Calls for the safe evaluation or training and leads on how to conduct a safe evaluation of outcomes were found elsewhere.

Organizations involved in the offshore drilling enterprise shared whatever information they had. However, they often had to start from basic principles of evaluation because no formal evaluations were available to them. For example, the Coast Guard could not provide a failure to launch rate from its inspections of offshore locations or from other sources (Wahle, 1984). Standards of satisfactory launching skills for entire crews could not be found. Neither the Education Retrieval Information Center nor the Psychological Abstracts data base could offer an study similar to this one. The United States Department of Defense would offer no similar studies (United States Department of Defense, 1985). Consequently, improvements in evaluation design and in the practice of education for the offshore oilfield evolved from the well intentioned criticisms of previous evaluations (Christman, 1985; Jones, 1986; Major, 1986).

The representatives of oil field related companies eventually did raise the need to safely evaluate the outcomes of training. Christman of Exxon Company, USA (1985:13) alluded to this when he wrote that

> The political and regulatory perception is that we have a problem.... We perceive a wide-spread belief that meeting regulatory laws assures an adequate level of safety.

He concluded, "There is a need to upgrade our industry marine safety practices." Christman implied that feedback was important in his recommendations for guidelines for abandonment drills. He wrote that the guidelines for a

good launching checklist should, "include a checklist for critical items (Christman, 1985:15)."

Major (1986), another representative of Exxon Company, USA, was more specific in the following year. Writing about training done on an offshore location, he (Major, 1986:5,6) wrote that

> drills should improve on a week to week basis reviewing the drills to identify areas for improvement which can be used as topics for the following drills.

Moreover, Major advocated the use of, "surveys similar to those of our initial examinations" (Major, 1986).

Jones (1986) of Zapata had shared the podium with Major to illustrate a practical application of Major's idea. Jones's reported evaluative method used trainees' end-of-course critiques and the supervisors' reports of subsequent training drills. He noted his successful use of supervisors to gather specific information, a procedure similar to Major's. In his follow-up, Jones had his crewmen critique the drills. Each supervisor's reports about the drills were also critiqued upon their arrival at the shore-based office of his safety department.

The above pertinent history of marine survival training described the maturation of training evaluation in the offshore oilfield. Evaluation evolved from the simple assessments of inputs to the assessments of inputs, outputs, and outcomes, particularly behavioral outcomes. Accordingly, the major applied research project conformed to the requirements of this trend.

Appropriate Data

Previous research by Zambon (1985) discredited the validity of end-of-course critiques for marine training. For example, 79 percent of his graduates had believed that the survival course was "...at the frontiers of knowledge in the field" instead of just a basic course on offshore survival. An end-of-course critique often provided subjective and invalid data. Consequently, only the observed behavior, whether on a written test or a performance test, was considered valid in this study.

End-of-course rating scales have been considered problematic by some researchers. For example, speaking of teaching effectiveness Miller (1984) revealed the difficulties in just this one aspect of course improvement. Miller cited a criterion-validity correlation of only .37 between student rating scales and student achievement. Consequently, Miller concluded that the ratings were unreliable, both over-rating and under-rating the effectiveness of the rated instructor. In his conclusions, he advised his readers that rating scales would be too uncertain until the criterion-validity of student rating scales reached correlations of .7 or .8.

Pulich (1984) offered some suggestions to improve the end-of-course student evaluations, but she offered no evidence that her improvements could be used to fairly evaluate teaching effectiveness. Consequently, the training department did not consider the end-of-course

critiques for Offshore Survival Systems Training useful. Only the objective measurement of the behavior of the trainees was considered appropriate. This behavioral measurement suited the problem to be solved.

McTaggart (1986:16) summarized the problem at the marine safety conference at the University of Florida.

> We must remember that training, by whatever means, is a continuous process that does not conclude with the completion of a structured program....
>
> We must inspect the student's on the job utilization of the training information and instruction and his post training behavior. We must provide him assurance that his training and his devotion to his job are of prime concern to management. We must obtain feedback on the value of our training efforts and be prepared to modify our programs where necessary.
>
> In an industry that today is experiencing the most critical financial period in its history, let us never forget that the price to be paid for loss prevention training is minimal when compared against the price that will be paid for a catastrophic loss.

Using behavioral observations, a case study could establish whether or not the graduates left the evaluated course at a higher level of competency than the level at which they entered. Determining the increase in competency was an aim of a case study (Posavac and Carey, 1985).

Another standard against which to evaluate the course was the per capita cost estimated for it. Cost figures developed by the United States Coast Guard could be used to evaluate the benefits returned to the company by the training. The United States Coast Guard (1985) had examined the cost of survival training. Its investigations concluded that the return on the investment would have been

considerable if the cost had been below the maximum figure published by the United States Coast Guard (1985), $750. It had estimated that the mean per capita expense should be $175. This figure, however, excluded travel and per diem expenses. The interim final rule (Department of Transportation, 1987:38666) stated that

> The training and qualifications contained in the interim final rule, which are strongly recommended by the National Transportation Safety Board, generally supported by industry, and under development internationally, will certainly be justified if they contribute to the prevention of the loss of even one MODU and its crew, or even minimize the down-time of an operating unit.

The appropriate data for this evaluation were primarily behavioral and financial. They consisted of the observations of changing launching behavior and the cost for the improvement.

Aim of Evaluation

For all its merits, the latest evaluative design for course improvement, the one described by Jones (1986), lacked a fixed standard for the launching performance for a crew. Fixing a standard for the performance of the graduates had been an unattended problem. On rational grounds alone, a perfect launch by each crewman on an offshore installation certainly was ideal, but it was also unrealistic. Even the United States Code of Federal Regulations, Title 46 subpart 109.125 required at most only two certified lifeboatmen for each survival craft carrying more than thirty people. Some adequate standard, but

Something short of perfection, had to substitute for a perfect launch by every graduate. The development of the standard was a problem. To compare the results of a case study against the results of another case study for a similar course was one conventional method to evaluate a course. In this regard, Best and Kahn (1986:93) observed that

> if the objective analysis of an adequate sample of cases leads researchers to consistent observations of relationships, hypotheses may be confirmed, leading to valid generalizations.

A systematic search of the literature uncovered no case study with circumstances similar to the one for Offshore Survival Systems Training. Offshore Survival Systems Training was the first course of its kind. Consequently, a first case study, as represented by this major applied research project, could contribute to the evaluation of subsequent survival courses and could lead to the improvement of education. Publishing the post-test rate of launching and the re-test rate of launching from such a case study could set a standard against which subsequent case studies could be compared.

Evaluation in the Field of Education

The literature on evaluation in the offshore oilfield provided important but incomplete ideas about how safe evaluation of training outcomes could be accomplished. Outside of the oilfield, evaluation had attended to the evaluation of inputs and then to the subsequent assessment

of outputs and outcomes (Craven, 1980). The literature on evaluation in the offshore oilfield demonstrated just this trend from the simple assessments of inputs to the assessment of inputs, outputs, and outcomes. The general literature delineated the shape of a successful evaluation.

Inputs and Outcomes

According to Craven (1980), courses could be considered as having inputs, such as, students, faculty, physical plants, and the like. Courses could also be considered as having outputs. Outputs were the immediate results of training. Courses could also be considered as having outcomes. These were the long-term effects of the course. In academic courses, outcomes could include such things as the earning power of the graduates or their civic participation. This major applied research project was concerned with the evaluation of outcomes. For convenience, outcome was operationally defined to mean either output or outcome.

The general literature on evaluation described how the evaluation should proceed. Although there were many kinds of evaluation, Knox (1986:167) had noticed the that

> The core of an evaluation plan is the design and the procedures for data collection and analysis. Typically, data are collected from representative samples of participants, instructors, administrators, and records in ways that minimize disruption of the ongoing program and encourage the use of findings.

An evaluation should unobtrusively collect data on the inputs, outputs, and outcomes of the examined course.

Appropriate Data

Issues regarding the most appropriate data and the best ways to collect and analyze them were important. Trapnell (1984:92) advised evaluation using pre and post-tests that are

> congruent with training objectives that truly measure what they purport to measure.... Employees' supervisors also might be involved in the assessment, which might use a single test or a combination of tests.

In evaluating the maintenance of skills, Del Gazio (1984: 30) advised, "It is important to measure observable behavior, not inferences about behavior." He believed that evaluation data had to be primarily objective observations of those purported to have been taught the skills. In terms of the present MARP research, recorded data obtained through observations of individual crewmen during trial launchings met this criteria. The recordings of the observations of the launchings of individual crewmen were ideal data.

Whittaker Survival Systems and Watercraft America, Incorporated, the only approved manufacturers of covered powered survival craft, provided training advice in many ways. They provided videotapes that showed exemplary launches. They provided training manuals (Whittaker Survival Systems, 1979, 1983; Watercraft America, Incorporated, 1982), and large decals with drawings that informed the viewer how to use the survival craft. These training aids specified what an individual had to do to

launch his craft. The steps in the launch were confirmed through the videotape Offshore Rig Abandonment produced by the Petroleum Extension Service of the University of Texas at Austin in Cooperation with the Safety Committee of the International Association of Drilling Contractors (Accident Prevention Committee, International Association of Drilling Contractors, 1980). The launching procedures were also confirmed by the manual of the lifeboat course of Shell Offshore, Incorporated (Adams, 1977). Observations of the launchings of individual crewmen were ideal data. Yet, two problems appeared.

It was reasonable to speculate that panic in an actual emergency abandonment could produce outcomes different from the outcomes measured in a training situation. Would such anxiety produce reactions in an actual emergency different from the outcomes those measured during a training situation? A review of the literature did not support such a speculation.

Greater eagerness to abandon an offshore installation than offshore crewmen currently feel could probably help their proper abandonment of an offshore installation. Schultz (1964) offered Quarantelli's observation about panic, "the most outstanding overt feature was found to be flight from a threatening situation." He further suggested that panic was, "non-rational rather than irrational in that panic participants do not consider the consequences of flight nor of other courses open to them." Hasty flight

from offshore installations did not kill crewmen. Delayed flight caused problems in the abandonment of offshore installations.

A major problem as reported in the literature has been the proper abandonment of an offshore installation in a timely manner. Evacuations of the crew using covered powered survival craft were delayed too long in each of the three major marine casualties. Interviews of members of the relief crews of the Ocean Ranger in the documentary "The Ranger Disaster" (McAnthony, 1983) revealed that some crewmembers had not even attended abandonment drills, and that some crewmembers had made their own private plans about how best to abandon the installation. In fact, they took too much time before deciding to leave the installation, and they had too many alternative means of leaving the installation in mind. During hurricane Juan, for example, two installations were lost and one damaged and men thrown into the Gulf of Mexico. Explanations for the failures to evacuate the installations before the arrival of the storms were sought by newsmen. Teague (1985), a vice president of Texaco, explained that Texaco's personnel, like the personnel of other companies, decided to stay on their installations despite the approach of hurricane Juan. As revealed in Sea Survival (Lastufka, 1983), failure to leave a vessel early enough was a common marine problem among those who worked on the seas. Hasty flights were not reducing the offshore crewmen's chances of

surviving the emergency abandonment of offshore installations. Prompter than usual flights from the installations were desirable.

The terror that could ignite panic could develop only in those instances when possible avenues of escape appeared to the crewmen, and the numbers and the adequacy of escape routes seemed to be insufficient, according to Foreman (Shultz, 1964). The subsequent experimentation by Kugihara, Naoki, Misumi, Jyuji, Sato, Seuchi, Shigeoka and Kazunobu (1982) and by Sugiman, Toshio, Misumi, and Jyuji (1984) confirmed the observations collected by Shultz. Under these conditions, the ill results of panic would be experienced at the doorways of the covered powered survival craft, but these are usually large. The training department did not view panic as a likely impediment to the successful abandonment of an offshore installation.

Idzikowsky and Baddeley (1983) reviewed the literature on a phenomenon different from panic, an anxiety reaction that appeared in dangerous situations. They defined a dangerous environment as one that "requires an active and correct response for an individual to survive (1983:126)." They (1983:141) concluded that

> when a situation has induced fear in an individual then a deterioration in the efficiency of performance can be expected, especially in tasks involving sensory-motor skill or divided attention.

The survivors of marine casualties (United States Coast Guard, 1976; United States Coast Guard, 1983) testified that they had not known how to operate a covered powered

survival craft, but they mentioned nothing that resembled serious performance decrements due to either a deterioration of sensory-motor skill or divided attention. The reports on marine casualties did not support the claim that anxiety reactions were a serious hindrance to the abandonment of offshore installations. Lack of knowledge and skills, rather, had impeded the abandonment of offshore installations. Determining how well crewmen launched during training situations could provide valuable insights into how well they might have behaved in an actual abandonment of an offshore installation (Brinkerhoff, 1987).

Norman (1976:65) reported that the best way to avoid the ill effects of anxiety reactions was to overtrain the personnel until the required behavior became automatic.

> Instructors of sports such as underwater diving, flying, or parachute jumping try to combat the effects of anxiety on performance by overtraining. The goal is to make the appropriate responses to different situations so automatic that they require no conscious attention. Automatic, non conscious actions seem to be less susceptible to disruption by level of arousal.

The United States Marine Corps Leadership Discussion Guide: Combat Leadership (Department of the Navy, 1984:9) described psychological reactions similar to the ones Norman described: inability to make decisions, overfixation with minor details, and lack of confidence. It advised its readers that training enabled armed forces personnel to overcome much of these psychological reactions. Safe training was held to prepare personnel to

act as efficiently as they could in a dangerous situation. Offshore Survival Systems Training, prepared men to act as efficiently as they could in a dangerous situation.

Brinkerhoff discussed how human resource development (HRD) departments evaluated the performance of individuals outside of a hazardous environment. Brinkerhoff (1987:135) noted that

> evaluation might assess whether HRD-acquired knowledge, skills, or attitudes have been retained and whether the potential for on-job use, and thus organizational benefit, remains intact. For example, a nuclear generation plant might train key personnel to deal with an extreme emergency. While the hope is that trainees will never have to use these skills, it is highly important that they possess them.... This sort of case evaluation might better be aimed at assessing trainees' ability to retain the skills that they might someday have to use.

In Educational Psychology, 2ed., Good and Brophy (1986:173) wrote about the improved retention of knowledge and skills.

> Knowledge and skills deteriorate over time. As a general rule, basic skills need to be practiced to the point of overlearning if they are to become available for efficient functional use when we need to apply them. This is why drills, quizes, review activities, and other forms of distributed practice are so important.

As stated earlier, unless overlearned, skills should have deteriorated without practice (Good and Brophy, 1986:240). "Active practice or rehearsal improves retention, and distributed practice is usually more effective than massed practice." Consequently, lack of frequent practice could be detected by observing an increase of faulty responses on re-tested performances of learned skills.

Nadler (1987) said that each supervisor should evaluate the performance of his subordinates. He explained that lines of authority became confused, and resentment against the training department increased, if instructors assumed the role of assessors of on-job performance.

Finally, Brundage and Mac Keracher advised assessing adults in threat-free situations and providing them with specific feedback (1980:100).

> Adult learning is facilitated by learning environments which are free from threat and which provide personal support for change. The teaching and learning activities need to include provision for testing new behaviours in relative safety, for developing mutually trusting relationships, for encouraging openness to feedback, and for reducing anxiety and fear of failure. Plans for learning behaviours should include a built-in success factor.
>
> Teachers need to remain flexible and responsive in spite of potential threats to their own self-concept or self-esteem.
>
> Program plans need to include activities which assist the learner to specify and clarify behaviours to be learned or changed, and specify and describe desired outcomes; which provide feedback in terms relevant to those behaviours and outcomes; which provide descriptive feedback that does not imply value judgments and that suggests possible future changes; which build good interpersonal relationships among learners and teachers; and which provide activities through which new behaviour can be implemented.

The general literature on evaluation supported the adequacy of discretely observed behavior as data for the evaluation of marine survival training.

Aims of a Case Study

Rossi and Wright (1986) recounted the development of evaluative studies through the 1960s, 1970s, and the first

half of the 1980s. They attested to the shift in evaluation from the assessment of solely a program's net effects using experimental designs to the improvement of programs using quasiexperimental or qualitative research designs. Generally, the disappointing experience with randomized experiments had lead to the reappraisal of the aims of an evaluation. Brown (1980) and latter Kelly, Orgel, and Baer (1984) recommended the articulation of the goals of a course as a step in the evaluation of the course. They advocated the use of designs that used already existing groups to gauge how the graduates had achieved the articulated goals of the training. The aim of such an evaluation was to obtain useful knowledge about the elements of the evaluated course. A good evaluative design would thus be one that would convince a knowledgeable audience that the course in question had produced a worthwhile outcome if it had indeed done so (Kelly, Orgel, and Baer, 1984:34).

> When training produces immediate improvements in performance every time, and those increases are large enough to be seen despite the inherent variability of behavior in the natural environment, then these designs provide powerful and convincing demonstrations of training effect.

Brown (1980:14) had gone so far as to advise drafting a graph to provide a visually convincing effect rather than to calculate a number for a statistical comparison.

> We don't need to employ any statistical procedures to analyze our results and determine whether or not the training seminars are successful; we need only look at our graphs.

Brown's extreme position emphasized the evaluation's purpose, to convincingly answer the questions of an audience.

Knox (1986:165) observed that

> Perhaps the most important question to consider is: Who are the main audiences for the evaluation report, and what issues concern them that your evaluation could address?

He adjured his readers to clarify the purposes, audiences, and issues of evaluation to decide the level of evaluation that was warranted. He further advised evaluators to involve important people in crucial positions in the planning and execution of the evaluation. He expected that by so acting, the evaluator could benefit from the suggestions of these important people, and the evaluator could encourage their use of the findings.

The findings could influence the planning for future educational efforts, the improvement of the current course, or the justification of the current course. In this case Knox (1986:172) offered the advice that

> if you are evaluating an educational program to help employees in an organization improve their performance, your main evaluation purpose may be to assess program impact on participants' subsequent performance.... Conduct the simplest evaluation possible that will answer the questions that you want to have answered, sample and use existing data where you can, and recognize that real-world evaluations should contribute information and commitment for decision making, in contrast to typical research which is aimed at more precise explanations.

Knox further asserted that the goal of summative evaluation of outcomes was the assessment of impact on learner performance and benefits to others.

Posavac and Carey (1985) provided specific limits and directions for a case study. Most importantly, they asserted that the case study could show that clients left a course at a certain level of competency, and they advised that the case study could show how much the participants had changed during the program. The audience of this case study needed to know "What came out of the course?" The audience also wanted to know which parts, if any, of the course needed improvement. "Which parts failed?"

Although Posavac and Carey advanced conservative aims for a case study, Cronbach (1980) asserted that under three conditions a one-group design could determine whether or not a treatment caused the change in the graduates. Cook and Mark (1984:103), having reviewed Cronbach's argument, summarized it.

> In general, we believe the adequacy of the one-group, pretest-posttest design for causal inferences depends on the following: ... the outcomes are novel, and the pretest-posttest interval is short, and ... obtaining sufficiently large pretest-posttest differences that no explanation other than a treatment effect is plausible.

The design of such a non-experimental evaluation should include components that eliminated plausible alternative explanations for the results of the investigation (Cook and Mark, 1984). Cronbach (1980) argued further that under three conditions, a one group design could allow inferences of cause: (1) the behavioral change was large, (2) The change occurred over a short period of time, and (3) the learned behavior was novel.

Elements of evaluation of offshore Survival Systems Training being addressed in this major applied research project consisted of what Brinkerhoff (1987) termed stage IV, V, and VI evaluations. These stages measured how well learning objectives were achieved, evaluated how well learning was used on the job and improved performance, and determined what value had been returned to the organization. Brinkerhoff's previous stages of evaluation (I, II, and III) were not germane to the present investigation since the equivalents of those stages had been reported elsewhere (Zambon, 1986b). The first three stages evaluated the goal setting and the needs analysis, the program design, and the implementation and the operation of the course. The stages pertinent to this major applied research project, however, consisted of stage IV, V, and VI evaluations. Succinctly, stage IV evaluation (Brinkerhoff, 1987) served to do the following:

1. To demonstrate the efficacy of the program, as well as to make revisions to it. Practitioners needed to know what worked and what did not;

2. To determine changes in skills, knowledge, or attitudes that resulted from a program which were not intended in the first place;

3. To determine which trainees achieved which learning results;

4. To plan for the transference of learning;

5. To plan for follow-up evaluation; and

6. To gather data for marketing claims.

In brief, stage V evaluation (Brinkerhoff, 1987) served to do the following.

1. To discover the hits and misses of the transfer of training so that if needed the guided revision of the program may occur;

2. To plan how to support increased transfer of training;

3. To plan stage VI evaluation; and

4. To document and account for transfer of training.

A data base for the on-going program would have allowed certain claims about the program, and it would have allowed future research into HRD needs and results.

Stage VI evaluation (Brinkerhoff, 1987) determined the value the course returned to the organization. The United States Coast Guard had estimated the cost for lifeboat and survival suit training to be between $120 and $750 per student with an average cost of $175 per student.

In summary, this major applied research project was an evaluation, specifically, a case study. Brinkerhoff had listed purposes for stage IV, V, and VI evaluations. All of his stages of evaluation aimed to convincingly answer the important questions of the audience for the evaluation.

Considerations on Inducing Offshore Training Drills

One purpose of this evaluation was to determine whether or not the provision of manuals coupled with the

announcement of eventual formal training resulted in an increase of the personnel's knowledge of safety and their ability to use the covered powered survival craft, before these employees had received formal training. Zambon (1987) had reported that the provision of manuals under such contingencies, resulted in the increase of the personnel's knowledge of safety. An investigation using a larger sample was recommended.

The conjecture, that the provision of study material along with the announcement of eventual formal training would lead to independent study, was induced primarily by theories of learning. The preinstructional situation offshore resembled behavioral learning schemes, to be described latter. The training department had drawn its conclusions from the following arguments.

The crewmen needed to learn much new information and to acquire or to maintain skills, but the conventional delivery of information was slow. An example illustrated the situation. The International Association of Drilling Contractors had submitted its task force analysis (Maritime Analysis Review Committee, 1984), regarding the training to be required of offshore supervisors, to the United States Coast Guard. This analysis described the training which the association agreed the United States Department of Interior should require by regulation. This analysis listed 114 topics of then inadequately addressed formal training.

Ten of the topics were incorporated into a new course. The delivery of this course to all the offshore employees of Diamond M Company required one year (Zambon, 1985). The formal conveyance of the information in the remaining topics was calculated to take approximately eleven years. Yet, this training was urgently needed. These topics addressed important needs of offshore personnel. The Coast Guard Summarized the situation.

In its undated notice of proposed rulemaking, issued in 1985, the United States Coast Guard wrote

> the training and qualifications contained in the proposal, which are strongly recommended by the National Transportation Safety Board generally supported by industry and under serious consideration internationally, will certainly be justified if they contribute to the prevention of the loss of even one MODU and its crew, or even minimize the down time of an operational unit.

(MODU meant mobile offshore drilling unit, or, as used in this study, installation) In a similar vein, the American Petroleum Institute called for the timely development of expanded training (Christman, 1985).

Management of Offshore drilling companies perceived the need to provide their offshore employees much new information and training. Could the early provision of manuals result in the improvement of both the prospective participants' knowledge and skills? The early distribution of manuals was an atypical, information dispensing strategy. Furthermore, it required company resources to correctly dispatch the manuals. The literature provided some information about the value of this procedure.

Learning was directly related to the period of studying (Levin and Long, 1981). The motivation of individuals to learn was of primary importance to learning. Where there was no motivation, there was no learning (Walberg and Uguroglu, 1980). Motivation caused the attempt to learn, it mediated learning, and it was a consequence of learning (Wlodkowski, 1985).

An assumption of cognitive evaluative theory (Wlodkowski, 1985:284) was that

> People will propel themselves to greater achievement out of their interests and desires for mastery. Environments and approaches that allow this are active education and its learning, active learning. People will be active in their learning if the situation allows and supports it. People are inately motivated to be effective in dealing with their environments and to master new situations.

Cognitive evaluation theory was a theory of adult motivation to learn, which corresponded to and supported the basic assumptions of Knowle's androgogy (Wlodkowski, 1985:238).

Although androgogy was a controversial theory, its generalization that the adult was a practical learner was widely accepted (Wlodkowski, 1985:5). Wlodkowski (1985:5) wrote his conclusions about what results from the adult's inate motivation to learn.

> Research consistently shows that vocational or practical education that leads to knowledge about how to do something is chosen by more adults than any other form of learning. Adults have a strong need to apply what they have learned and to be competent in that application.... Knowles believes that the deepest human need is for self esteem. It can be generalized, therefore, that adults by definition, learning theory, and social research are responsible people who seek to

> build their self-esteem through pragmatic learning activities in which their competence is enhanced.

Brundage and Mac Keracher (1980) wrote that adults were highly motivated to learn in areas related to their current developmental tasks. This idea of theirs persisted through the years. Recently, Knox (1986) cited occupational concerns as developmental tasks that determined the subjects which middle class men pursued during their productive years.

Nevertheless, in all this related literature, the role of past experience admittedly affected the motivation to learn. Wlodkowski (1985:9) wrote, "The two most commonly found barriers in this area relate to age and educational background." Brundage and Mac Keracher (1980) also cited the learner's past experience as a helpful resource or as a potential hindrance to his current learning.

The behaviorists did not see the educational history of the individual as just a factor in his learning; they saw it as the factor. They did break down experience into schedules of reinforcement, however. The founder of androgogy, Knowles, raised the issues of reward and punishment. Knowles (1975:21) wrote that

> Teacher directed learning assumes that students are motivated to learn in response to external rewards and punishments ... whereas self-directed learning assumes that learners are motivated by internal incentives such as the need for esteem (especially self-esteem), the desire to achieve, the urge to grow, the satisfaction of accomplishments, the need to know something, and curiosity.

The explanations of the effects of the learner's educational experiences and of his previous experience with rewards and punishments placed the cognitive evaluation theory into a loose opposition to the behavioral approach to explaining learning. Nevertheless, this opposition was irrelevant in this study. Even the behavioral approach to explaining learning allowed the prediction that individuals who were faced with eventual training would independently study available material. This conclusion was drawn for the following reasons.

Behaviorally, Atkinson, Atkinson, Smith, and Hilgard (1987:219) defined learning as a "relatively permanent change in behavior as a result of practice." They further stated that

> When a conditioned response has been associated with a particular stimulus, other similar stimuli will evoke the same response.

This generalization would occur, they continued, "although generalization may be curbed by discrimination training."

Their main point was that subjects, once conditioned according to one scheme, later acted as conditioned in a similar scheme. This was what learning was all about. According to the principles that predicted whether or not learning would occur, an individual could have reacted in any of several ways. Each individual probably viewed his eventual training as either a reward or as an aversive stimulus. He might have, therefore, responded to the

generalized stimulus of further training in any of four ways. He might have tried (1) to approach the reward (2) to avoid the reward (3) to approach the aversive stimulus (4) to avoid the aversive stimulus. (The best explanation of avoidance learning involved escape conditioning, so a further outcome did not need listing (Atkinson, Atkinson, Smith, and Hilgard, 1987). On the one hand, the approach to a reward and the avoidance of an aversive stimulus implied that the prospective trainee would study ahead of time (Domjan and Burkhard, 1982). On the other hand, the avoidance of a reward and the approach toward an aversive stimulus implied that the trainee would not study. These last two behaviors corresponded to uncommon behaviors. The scarcity of the kinds of students, who behaved like this, might have been inferred from the preoccupation of learning theories with the students who approached a reward or who avoided an aversive stimulus. Nevertheless, the avoiders of study were mentioned in some literature. Good and Brophy (1986) cited the "alienated student" as one of Good's and Power's (1976) five types of student. This type was a reluctant learner.

The early schooling of the trainees could have trained them to study to gain a reward, or to avoid unpleasantness, or to avoid study at all costs. They learned some behavior that was a response to the stimulus of a demand that they learn something new. Learning to gain a reward was called operant conditioning. Learning to avoid unpleasantness was

called avoidance learning. As adults, some prospective trainees might have viewed the lack of safety knowledge or the lack of a passing grade as an "aversive stimulus," to be removed through study. Their acquisition of this knowledge should have acted as a "negative reinforcer." For them, studying was the repetition of an already learned "avoidance behavior," avoidance of an aversive situation.

Other prospective trainees might have viewed the acquisition of safety information or the attainment of a good grade exclusively as a "reward" to be pursued through study. Those trainees who had been conditioned not to study constituted an unknown portion of the offshore personnel. Consequently, whether the employees viewed their situation with apprehension or eagerness, learning theory predicted that some would independently study and consequently learn. Whether they would or not was not obvious.

Cognitive evaluative theory and its related theories allowed the prediction that offshore personnel would try to study the practical, environmentally related manuals set aboard their installation, and that they would train with their covered powered survival craft. The behavioral approach to explaining learning allowed the prediction that the manuals and the announcement of formal training would elicit studying and training from some offshore personnel. This prediction was weakened by the possibly mitigating effects of the personnel's experiences, environments, and

other variables. Knox (1986) cited anxiety and fear of failure as factors discouraging learning. The list could be longer. These factors, that mitigated learning, might have acted weakly or powerfully; these factors might have allowed learning or not. Whether or not the provision of the manuals for a prospective course and the announcement of the eventual training elicited independent study or independent training from prospective trainees was to be decided by an observational study along the lines used by Zambon (1987).

Summary

The literature supported the following statements. An evaluation of a course should address the concerns of its audience (Knox, 1986). The interested audience for the evaluation of Offshore Survival Systems Training comprised the United States Coast Guard, the International Association of Drilling Contractors, The American Petroleum Institute, the Marine Survival Training Center Steering Committee of the University of Southwestern Louisiana, the clients of the evaluated company as well as its sales, risk management, safety, and training departments. This audience for the evaluation of Offshore survival Systems Training wanted to know whether or not the knowledge and particularly the skills of offshore crewmen had significantly increased after the two day course. It also wanted to know whether or not the knowledge and skills had

been transferred to the job. The maintenance of an individual's skill seemed to depend on his frequency of practice. Skills were held to deteriorate in the absence of practice, to persist with practice (Good and Brophy, 1986). This principle had implications to the gathering of data. It was consonant with other principles for the gathering of data. When gathering evaluation data it was best to use simple and unobtrusive processes, using data already at hand whenever possible (Knox, 1986).

Short of a perfect outcome, the components of a course should be evaluated in order to trace any failures of the course to produce the outcome (McTaggart, 1986). Brinkerhoff's (1987) stages of evaluation should be used to pinpoint the deficiencies in a course. Behavioral observations should primarily provide the data for this kind of evaluation (McTaggart, 1986). Such observations should occur in a setting as stress-free as possible for the assessed individuals and their supervisors (Brundage and mac Kereacher, 1980). The supervisors are the ideal collectors of the data (Jones, 1986; Trapnell, 1984; Nadler, 1987). The literature seemed to reject the possibilities that the effects of panic or anxiety reactions contributed to the deaths or injuries of personnel during an abandonment of an offshore installation. Crewmen usually stayed unaccountably calm in dangerous, offshore situations (Mc Anthony, 1983; Teague, 1985; Lastufka, 1983).

Besides the measurement of change in launching skill, the measurement of change in knowledge was undertaken because knowledge guides all the learning of individuals. An increase the knowledge of survival was an auxiliary outcome to the outcome of increased launching frequency. Instruments similar to the original surveys were recommended (Major, 1986) in the assessment of learning, so the pre-tests were to be used in the measurement of the increased knowledge of the graduates. The literature also supported the following statement. The announcement of formal training and the issuance of printed study material could have induced offshore personnel to independently study marine survival (Zambon, 1987). The literature cited supported the need for the major applied research project and gave direction to its major elements. Consequently, the efficacy of the course could be determined and stated. Recommendations about the improvement of the course could follow.

Chapter 3

PROCEDURES AND METHODOLOGY

Important organizations had called for the development of a shore-based course to train offshore oilmen to launch their covered powered survival craft. Some of the important organizations subsequently called for safe the evaluation of this training. The purpose of this major applied research project was to safely evaluate the effectiveness of a novel course, Offshore Survival Systems Training. The major outcome to be evaluated was the increase in the frequency with which offshore personnel correctly launched the covered powered survival craft. To be directive of future steps to possibly improve the course, this evaluation incorporated the examination of additional, auxiliary outcomes. Each outcome corresponded to an important research question that interested the audience for this evaluation. The procedures and methods for the evaluation follow.

Only crewmen of Diamond M Company were involved in this study. The training department had called one crew at a time from the offshore installations to come to the training center for formal training in marine survival. Each crew had been scheduled for training according to the mutual availability of the crew and of the training center. The crews had been scheduled according to no other

particular rule. Training had begun on January 1, 1985, and the last crew had been trained by June 16, 1987. The first crew from each installation was called an initial contingent. All other crews were called subsequent contingents. Initial contingents did not have manuals of the course available to them before their formal training. The subsequent contingents did have manuals available to them.

At the training center, each crewman completed performance and written pre-tests. After each pre-test each crewman received intensive training in marine survival. The course lasted two days. At the end of the formal training, each crewman completed written and performance post-tests. The written post-test had the same questions on it that the pre-test had. For each trainee, the numbers correct for his written pre-test and his post-test were marked on the attendance sheet for his crew. The performance post-test was the same as the launching pre-test. The assessment for each crewman could be either that the trainee got away from the platform unaided or he did not get away from the platform unaided. For each trainee, the results of his performance pre-test and for the performance post-test, were recorded on the attendance sheet for his crew. This post-testing completed the formal training. After formal training, each graduate received quarterly written assignments in the form of a list of questions on marine survival.

Three months after every crew had been sent to formal training, 63 of the graduates were randomly selected to undergo performance re-tests. To assess these graduates on the job required their supervisors' assessment of their performance on a launching checklist. The training department sent the names of the selected men to their appropriate supervisors. At the same time, it sent the supervisors checklists and instructions for the assessment of the selected graduates. The training department had carefully composed both the checklists and the instructions for the assessments.

The training department received the help of the operations department to ascertain the appropriateness of the launching checklist and to pilot test the instructions for the launching checklist. The operations department's review of the contents and proposed instructions for the launching checklist had served as a severe test for its exact communication of instructions to its administrators. They advised the authors of the instructions which behaviors to assess and how to increase the ease with which the supervisors could complete the checklists. The instructions for the assessment instrument were further tested on and modified according to the suggestions of cooperative yard personnel. Additionally, the wording of the instructions to the intended administrators was cast in non-threatening language. For example, the assessments of the graduates were described as evaluations of the course,

not of the graduates. Everyone involved in the pilot testing agreed that the checklist would gather appropriate data fairly unobtrusively. Finally, memoranda requiring the cooperation of all crewmen were issued by the operations department of the company.

During the period of the performance re-tests, all of the 231 graduates still employed by the company were asked to complete written re-tests. The written re-test was a copy of the 52 item, criterion referenced pre-test developed for the course, Offshore Survival Systems Training. The administration of the written re-tests followed the existing company procedure used to administer the quarterly supplemental study assignments, except that cooperation among the graduates was prohibited. Further pilot testing had led to the refinement of the instructions to the supervisors for administering the written re-tests. Agreed upon wordings were used (Appendix B). The wording of the instructions to the intended administrators was cast in non-threatening language. For example, the assessments of the graduates were described as evaluations of the course, not of the graduates. The pilot testing had involved cooperative individuals in the office and yard of Diamond M Company. Minor administrative problems had been corrected by the time data were collected from the men on offshore installations. Everyone involved in the pilot testing agreed that the instructions were easily understandable.

All of the still employed graduates completed their written re-tests. All of the crewmen randomly selected for performance re-testing were assessed on checklists by their supervisors. The results of both the written and performance re-tests were forwarded to the training center. Details of the method used to gather the data follow.

Offshore supervisors administered the written re-tests and the performance re-tests to offshore crewmen. The performance re-tests comprised the actions to launch the covered powered survival craft to which the examinees had been assigned. To launch was to get away from the launching platform. The required actions had been printed in order on a checklist (Appendix A). This checklist followed the written and illustrated instructions found in the operation and training manuals for the craft. The administrator of the performance re-test had to mark the first step in the checklist that his subordinate missed, if any. It also required the supervisor to time his subordinate from the time the subordinate received the signal to abandon his installation to the time he reached the survival craft. Any checklist with no mark on items one through six signified a successful launch. The supervisors were invited to telephone the training department about any questions they had about the instructions for the assessment.

A supervisor, the Barge Captain, administered the performance tests to most of the crewmen. In some

instances when Barge Captains emerged as part of the group who been randomly selected to take the performance re-test, installation (rig) superintendents were assigned to observe them. Actually launching a survival craft could have been dangerous at some offshore locations, so the supervisors were given the option to consider only the correctness of the motions of the men they assessed. The correctness of the returned launching checklists were ascertained by a follow-up telephone call to the administrators of the checklists.

The written re-tests were issued to every graduate still with the company as of October 1, 1987. Accordingly, packets of written re-tests were sent to the appropriate supervisors. Each supervisor's packet contained re-tests, each of which had the appropriate graduate's name printed on it. Two hundred thirty-one such tests were issued. Launching checklists were issued to the supervisors of the men who were randomly chosen for performance re-testing. Sixty-three checklists were issued to increase the chance that at least 30 completed forms would be returned. Fewer than 30 completed forms would have complicated the necessary statistical tests, so a greater number of forms were sent out. The returning information was sorted and compared to the original pre-tests or post-tests as the appropriate statistical treatments of the data required. The pre-test and post-test scores were on file at the training center of Diamond M Company.

The procedures for treating the data for the major applied research project were designed to answer the following research questions.

Research Question One

Did the company-wide percent of personnel who were able to launch a covered powered survival craft but who were untrained increase during the period of Offshore Survival Systems Training from January 1, 1985 to June 16, 1987? The corresponding null hypothesis read,

"The percent of untrained individuals who could launch their covered powered survival craft during the fore part of Offshore Survival Systems Training was the same as the percent of untrained individuals who could launch their covered powered survival craft during the latter part of Offshore Survival Systems Training."

The first five initial contingents from the installations were pooled to form one group. The last four initial contingents from the installations were pooled to form another group. The initial contingents had no opertunity to read the course manuals before they attended training. The data from the initial contingents should not be contaminated. The nominal data on who successfully launched during the hands-on pre-tests were on file (N=139) at the training center. A chi-square test at the five percent level of significance (df=1) was used to test this null hypothesis (Best and Kahn, 1986). The test was

repeated using only the data for those marked for retention from the fore and from the latter groups.

Research Question Two

Did the written pre-test scores increase over the period from January 1, 1984 to June 16, 1987? The corresponding null hypothesis stated,

"The mean of the of the pre-test scores taken from the fore part of the course was the same as the mean of the pre-test scores taken from the latter part of the course."

The first five initial contingents from the installations were pooled to form one group. This fore group contributed a mean written pre-test score. The last four initial contingents from the installations were pooled to form another group. This latter group contributed another mean written pre-test score. The nominal data for calculating these means were on hand at the training center. A z-test at the five percent level of significance compared the two means to test the null hypothesis (Best and Kahn, 1986). The test was repeated using only the data for those marked for retention from the fore and from the latter groups.

Research Question Three

Did the course teach the crewmen anything? Another way to ask the question follows. Was the mean of the differences between the written pre-test scores and the

post-test scores significantly different from zero? The corresponding null hypothesis read,

"The mean of the differences between the written pre-test scores and the post-test scores was zero."

The required data were measurements on an interval scale, each graduate's percent correct out of the 52 criterion referenced pre-test and the percent correct on his post-test. The company's training center kept the scores of of the 628 graduates on file. This data conformed to the requirements of Posavac and Carey (1985), Cook and Mark (1984), and Cronbach et al. (1980). They advanced a pre-test post-test design for a case study. The threats to internal validity could also be individually addressed (Cook, Cook, and Mark, 1977).

A negative answer to the second research question, would have mitigated the threat to the internal validity of this design from the possible effect of history, maturation, or regression. A z-test at the five percent level of significance for the mean of the differences was used to test this null hypothesis (Summers, Peters, and Armstrong, 1977).

Research Question Four

During the period from January 1, 1985 to June 16, 1987, did Offshore Survival Systems Training produce an increase in the percent of individuals who could launch the covered powered survival craft over the percent of

individuals who could launch during the pre-tests? The corresponding null hypothesis stated,

"The percent of participants who could launch their covered powered survival craft during the practical post-tests of Offshore Survival Systems Training was the same as the percent who could launch during the practical pre-tests of Offshore Survival Systems Training."

Counts of nominal data, the successes at launches and the attempts to launch, (N=628), were collected from the attendance sheets on file at the training center. The change in the proportion of individuals who could launch from the pre-tests to the post-tests was compared to zero. This design fit the requirements of Posavac and Carey (1985), Cook and Mark (1984), and Cronbach et al. (1980). The threats to internal validity had to be individually addressed (Cook, Cook, and Mark, 1977). A negative answer to the first research question, would mitigate the threat to the internal validity of this design from the possible effect of history, maturation, or regression. A z-test compared the change in the ratio of individuals who could launch from the pre-tests to the post-tests at the five percent level of significance to zero (Sellers and Vardeman, 1982).

Research Question Five

Did the provision of manuals coupled with the announcement of eventual training result in an increase of

the participants' knowledge of safety before these employees received formal training? The corresponding null hypothesis follows.

"There was no significant difference between the pre-test mean of the personnel having manuals and the pre-test mean of the personnel lacking manuals before formal training."

Only the initial contingents from each installation lacked manuals. The subsequent contingents had manuals available to them. The mean of the group comprising the first contingents was compared against the mean of the group comprising the subsequent contingents. The names of the installations, the dates of attendance, the roster of the class, and the pre and post-test scores were all listed on the attendance sheets. Interval data from written pre-tests on file at the training center were used. These two means were compared at the five percent level of significance using a z-test (Best and Kahn, 1986). The test was repeated using only the data for those marked for retention from the fore and from the latter groups.

Research Question Six

During the period from January 1, 1985 to June 16, 1987, did the announcement of eventual formal training along with the provision of manuals produce an increase in the launching pre-test scores? The corresponding null hypothesis stated,

"The pre-test rate of launching of the initial contingents from the installations were equal to the pre-test rate of launching from the subsequent contingents from the same installations."

Only the initial contingents from each installation lacked manuals. The percent of successful launches for the group comprising the initial contingents was compared against the percent of successful launches for the group comprising the subsequent contingents. These data were on file at the training center. The pre-test rates of launching of the initial contingents from the installations were compared to the pre-test rates of launching of the subsequent contingents at the five percent level of significance (df=1) from the same installations using a z-test (Best and Kahn, 1986). The test was repeated using only the data for those marked for retention from the initial and from the subsequent groups.

Research Question Seven

Did the graduates take more knowledge about marine survival to the job than they did before the course? What was the mean of the differences between the written re-test scores and the original written pre-test scores? Only the scores of those still employed were used. The subsequent analysis could say somthing about the final situation on the installations. The interval data for this research question were the trainees' percents correct out

of 52 criterion-referenced, written, multiple choice questions on their pre-tests and re-tests. Installation supervisors were used to readminister the pre-tests to their graduates of Offshore Survival Systems Training. Two hundred and thirty-one graduates had remained employed; each returned his re-test to the training center by way of his supervisor. The original pre-tests were on file at the training center. The mean of the differences between the data was calculated and reported (Summers, Peters, and Armstrong, 1977).

Research Question Eight

Was the mean of the differences between the written pre-test scores and the written re-test scores still significantly different from zero, that is, at least three months after graduation? The null hypothesis for this research question stated,

"The mean of the differences between the pre-test and re-test scores was zero."

Only the scores of those still employed were used. The interval data for this research question were collected as described for research question seven. The scores for the pre-tests were recorded on the attendance sheets kept on file at the training center. The supervisors pprovided the written re-test scores. A z-test compared at the five percent level of significance the mean of the differences to zero (Summers, Peters, and Armstrong, 1977).

Research Question Nine

How much of their learning had been transferred to the job? In other words, was the mean of the differences between the written post-test scores and the written re-test scores still significantly different from zero? The null hypothesis stated,

"The mean of the differences between the post-test and re-test scores was zero."

Only the scores of those still employed were used. The interval data for the re-test for this research question were collected as described for research question seven, except that post-test scores were collected instead of re-test scores. The post-test scores were on hand at the training center on the attendance sheets. A z-test compared the mean of the differences to zero at the five percent level of significance (Summers, Peters, and Armstrong, 1977).

Research Question Ten

Which facts had been forgotten most often? The written re-tests scores were collected as described for research question seven. These data consisted of percent of times that each item was answered incorrectly on the written re-tests. The number of each question and the frequency that each was missed were reported in rank order. In case the resources of the department could to handle only one

problem at a time, knowing the most widespread problem was important.

Research Question Eleven

How many graduates made their mistakes at each part of the launch during the re-tests? This question required no null hypothesis. Appropriate supervisors were directed to assess the launching behaviors of randomly assigned graduates of Offshore Survival Systems Training aboard his offshore installation. Each supervisor completed a special checklist for each observed graduate. On it he indicated the first step in the launching procedure, if any, that each of his subordinates missed. Sixty-three forms were issued and returned to the training department. These forms provided counts of nominal data. The missed steps were reported in rank order. The counts were used to calculate the percent of graduates who could still launch. These data were also used to answer research questions twelve, thirteen and, fourteen.

Research Question Twelve

What percent of the graduates retained their abilities to launch a covered powered survival craft? Only the scores of the 63 randomly selected and still employed graduates were used. These data were collected by the supervisors using a launching checklist as in question eleven. On the checklist, the responses to items one

through six corresponded to this research question. The rest of the responses dealt with the recovery of the craft. The percent of the checklists with items one through six left blank was calculated. This was the percent who successfully launched their covered powered survival craft.

Research Question Thirteen

Was the percent of the graduates who could launch a covered powered survival craft during the re-tests significantly greater than the percent found through the pre-tests? The corresponding null hypothesis read,

"The percent of graduates who could launch a covered powered survival craft during the re-test was the same as the percent of those who could launch a covered powered survival craft during the pre-tests."

Data for the re-test rate of launch for this comparison were collected as described under research question eleven. Data on the pre-test rate of launch for those marked for retention were on hand at the training center on the attendance sheets. This analysis involved counts of nominal data. The change in proportion was compared to zero at the five percent level of significance by a z-test (Sellers and Vardeman, 1982).

At this time, another issue arose. Did the passage of a period of time longer than three months significantly affected the re-test performance of the 63 randomly selected crewmen. Since this was an important, testable

issue, procedures to decide the issue were developed on the spot. The 63 previously collected, performance re-test scores were sorted into two groups. One group contained the re-test scores for the graduates who had been graduated during the first six months of the training effort. The second group contained the re-test scores of the graduates who had been graduated after the first six months of the training effort. A sort of this kind was possible since the attendance sheets were dated. The corresponding null hypothesis stated

"There is no significant difference between the rate of launching for those who were graduated during the first six months of the training effort and the rate for those who were graduated after the first six months."

A chi-square test at the five percent level of significance (df=1) was used to test this null hypothesis (Best and Kahn, 1986).

Research Question Fourteen

Was the percent of graduates who could launch a covered powered survival craft during the re-tests significantly greater than the percent found through the post-tests? The corresponding null hypothesis read,

"The percent of the graduates who could launch a covered powered survival craft during the re-tests was the same as the percent of those who could launch a covered powered survival craft during the post-tests."

Data on the performance re-tests for this comparison were collected as described in research question eleven. Data on the performance post-tests for those marked for retention were on hand at the training center on the attendance sheets. This analysis involved counts of nominal data. The change in proportion was compared to zero at the five percent level of significance by a z-test (Sellers and Vardeman, 1982).

Research Question Fifteen

Was the cost per graduate below $750. The amounts spent for each class for room, board, transportation, instructor's salary, equipment lease, overhead, and reimbursements were totaled. The total was divided by the number of participants in Offshore Survival Systems Training. For comparison against the per capita cost of the Coast Guard, the computation will be recalculated without including the costs of room, board, transportation, and reimbursements. These data were on hand at the training center. The data had been kept on a computerized filing system allowing easy manipulation of the data.

Chapter 4

PRESENTATION OF RESULTS

For each research question that had a null hypothesis, the null hypothesis has been stated. For each research question that did not have a null hypothesis, the research question has been stated. For each question, the data were summarized, and the corresponding statistical conclusion presented.

Of the 648 scores from the graduates of Offshore Survival Systems Training, twenty were excluded from the study. Of these twenty, thirteen scores had been earned in a pilot class, and seven scores had been earned on an experimental pre-test. These scores were unusable for this evaluation. The twenty discarded scores had come from participants who had been randomly selected, so the remaining scores should not have produced biased statistics. Thus, the pre-test and post-test results of 628 graduates were available for use in the evaluation. By the time the re-tests were administered, the company's personnel department had selected 301 graduates for possible retention during the then prospective austere time. Because of the short-term contracts for offshore installations at this time, only 231 of this pool were employed during the administration of the re-tests.

1. "The percent of untrained individuals who could launch their covered powered survival craft during the fore part of Offshore Survival Systems Training was the same as the percent of untrained individuals who could launch their covered powered survival craft during the latter part of Offshore Survival Systems Training."

Table 1

Number of Untrained Crewmen, from the Initial Contingents, Who Were Able to Launch Their Craft During the Fore Part of the Training Effort Compared to the Number of Similar Crewmen from the Latter Part of the Training Effort, Calculated Values of $\underline{x}^2$, and Level of Significance

Outcome	Fore Part	Latter Part
Launched	8	14
Failed to Launch	63	54
Totals	71	68

$\frac{df}{\underline{x}^2} = 1$

Calculated $\underline{x}^2 = 1.619$ NS

NS Not Significant at the .05 level

Only the records for the initial contingents of each installation were used in this analysis. These scores were uncontaminated by the contingent's possible use of manuals before formal training. A chi-square test with one degree of freedom was used with the data in Table 1. As a result, the first null hypothesis was not rejected at the

five percent level of significance. Considering only those employees from the initial contingents who were eventually selected for retention during the then prospective austere times (Table 2), a chi-square test led to the same conclusion at the five per cent level of significance. The null hypothesis again was not rejected.

Table 2

Number of Untrained Crewmen, Marked for Retention, from the Initial Contingents, Who Were Able to Launch Their Craft During the Fore Part of the Training Effort Compared to the Number of Similar Crewmen from the Latter Part of the Training Effort, Calculated Values of $\underline{x}^2$, and Level of Significance

Outcome	Fore Part	Latter Part
Launched	4	10
Failed to Launch	29	31
Totals	33	41

$\underline{df} = 1$
$\underline{x}^2 = 1.084$ NS

NS Not Significant at the .05 level

2. "The mean of the of the written pre-test scores taken from the fore part of the course was the same as the mean of the pre-test scores taken from the latter part of the course."

After collecting the data (Table 3) and testing the second null hypothesis, the difference in the means was

not found to be statistically significant ($p>.05$). The null hypothesis was not rejected.

Table 3

Assignment of the Pre-test Means, Variances, and Totals, for Untrained Personnel from Initial Contingents According to the Training Periods, Calculated z-Score, and the Level of Significance

Item	Fore Part	Latter Part
Mean Pre-Test Score	42.59	42.56
Variance	349.21	589.89
Totals	71	68

Calculated Value of z = .01007 NS

NS Not Significant at the .05 level

These personnel could not have been contaminated by returning graduates or their manuals. The overall pre-test mean for this group was 42.58 ± 3.59 at the 95 percent level of confidence.

The null hypothesis was again tested, but this time using only the scores from those who were eventually selected for retention (Table 4) during the then prospective austere times. This time, the means were found to be significantly different. The pre-test mean score for those marked for retention was 40.97 ± 4.50 percent at the 95 percent level of confidence. Although the null

hypothesis was rejected, the latter group of initial contingents earned a lower mean than the early group did.

Table 4

Assignment of Pre-Test Means, Variances, and Totals for the Untrained Individuals Marked for Retention from the Initial Contingents According to the Training Periods, Calculated z-Score, and Level of Significance

Item	Fore Part	Latter Part
Mean Percent	50.48	33.32
Variance	329.20	438.11
Totals	33	41

Calculated Value of z = 3.78 *
* Significant at the .05 level

3. "The mean of the differences between the written pre-test scores and the post-test scores was zero."

Of the 648 scores from the graduates of Offshore Survival Systems Training, twenty were excluded from this study. Of these twenty, thirteen scores had been earned in a pilot class, and seven scores had been earned on an experimental pre-test. These scores were unusable. The twenty discarded scores had come from participants who had been randomly selected, so the remaining scores should not have produced biased statistics. Scores from 628 graduates were suitable for testing this null hypothesis. A z-test compared the mean of the differences to zero.

The null hypothesis was rejected at the five percent level of significance ($p<.05$).

Table 5

Mean Difference, Variance, Number, and Calculated z-Score for the Pre-Test and Post-test Scores, and Level of Significance

Item	Result
Mean of the Differences	-44.79
Variance	406.45
Calculated Value of z	-55.67 *

* Significant at the .05 level

$N = 628$

At the 95 percent level of confidence, the pre-test mean score was 50.28 ± 1.69 percent, and the post-test mean was $95.07 \pm .59$ percent.

4. "The percent of participants who could launch their covered powered survival craft during the practical post-tests of Offshore Survival Systems Training was the same as the percent who could launch during the practical pre-tests of Offshore Survival Systems Training."

In other words, the mean of the differences was zero. The data were collected (Table 5), and the null hypothesis was tested. A z-test was used for this comparison. The difference in the proportions of those who could launch during the pre-tests and during the post-tests

was significant at the five percent level of significance. The null hypothesis was rejected.

Table 6

Numbers of Successful Launches of the Survival Craft for the Performance Pre-Tests and Post-Tests, Difference in Proportions, Calculated Value of z, and Significance Level

Outcome	Pre-Test	Post-Test
Launched	71	628
Failed to Launch	556	0
Totals	628	628

Calculated value of z = -31.6361 *
Difference in proportions .899
* Significant at the .05 level

5. "There was no significant difference between the pre-test mean of the personnel having manuals and the pre-test mean of the personnel lacking manuals before formal training."

Each installation had sent each of its four contingents to formal training at separate times. The mean of the initial contingents from the installations was compared against the mean of the subsequent contingents. The means were not equal (Table 7) at the five percent level of significance. Using only those who were selected for retention (Table 8) during the then prospective austere

times, the means were statistically different, and the null hypothesis was rejected.

Table 7

Means, Variances, and Numbers of the Pre-Test Scores of the Initial Contingents and of the Subsequent Contingents of Participants, Calculated Value of *z*, and Level of Significance

Item	Initial	Subsequent
Mean	42.567	52.21
Variance	463.535	445.69
Numbers	139.00	489.00

Calculated value of *z* = -5.24 *
* Significant at the .05 level

Table 8

Means, Variances, and Numbers for of the Pre-Test Scores of Those Marked for Retention from the Initial Contingents and from the Subsequent Contingents of Participants, Calculated Value of *z*, and Level of Significance

Item	Initial	Subsequent
Mean	40.97	56.68
Variance	458.19	428.53
Number	74.00	227.00

Calculated value of *z* = -33.45 *
* Significant at the .05 level

6. "The pre-test rate of launching of the initial contingents from the installations were equal to the pre-test rate of launching from the subsequent contingents from the same installations."

A chi-square test compared the data for independence of classification. The change in percents (Table 9) was not significant ($p>.05$) at the percent level of significance.

Considering only those who were eventually selected for retention (Table 10) during the then prospective austere times, the proportions were not statistically different ($p>.05$). A chi-square test was again used. The null hypothesis was not rejected.

Table 9

Assignment of Numbers of Untrained Individuals Able to Launch Survival Craft to the Initial or Subsequent Contingents, Calculated x^2 Value, and Level of Significance

Item	Initial	Subsequent
Launched	21	51
Failed to Launch	118	438
Number	139	489

$df = 1$

Calculated Value of $x^2 = 1.896$ NS

NS Not Significant at the .05 level

Table 10

Assignment of Numbers of Untrained Individuals Able to Launch Survival Craft and Marked for Retention to the Initial or Subsequent Contingents Calculated $\underline{x}^2$ Value, and Levels of Significance

Item	Initial	Subsequent
Launched	15	39
Failed to Launch	59	188
Number	74	227

$\underline{df} = 1$

Calculated Value of $\underline{x}^2 = .1824$ NS

NS Not Significant at the .05 level

7. "Did the graduates take more knowledge about marine survival to the job than they did before the course?"

At the 95 percent confidence level, the mean difference of the written pre-test and re-test scores was 35.45 ± 3.33 in favor of the re-test.

8. "The mean of the differences was zero." In other words, "The mean difference between the written pre-test and re-test scores was zero."

A z-test was used to compare the mean difference of the scores to zero. The null hypothesis was rejected ($\underline{p} < .05$). The pre-test mean was 50.28 ± 1.69 percent at the 95 percent level of confidence. At the 95 percent confidence level, the re-test mean was 86.26 ± 1.46 percent.

Table 11

Mean of the Differences, Variance, Number, and Calculated z-Value for the Pre and Post-test Scores, and Level of Significance

Item	Result
Mean of the Differences	35.45
variance	666.98
Number	231.00
Calculated Value of z	20.86 *

* Significant at the .05 level

9. "The mean difference between the written post-test and re-test scores was zero."

Table 12

Mean of the Differences, Variance, Number, and Calculated z-Value for the Post-Test and Re-Test Scores, and Level of Significance

Item	Result
Mean of the Differences	-8.92
Variance	251.91
Calculated Value of z	-8.54

* Significant at the .05 level

N = 231

In the testing of the null hypothesis, the difference in the means was statistically significant ($p<.05$). The null hypothesis was rejected.

10. "Which facts had been forgotten most often?"

Table 13

Questions Ranked by the Number of Correct Responses

Rank in Ascending Order	Number of the Question	Number of Correct Responses
1	27	127
2	41	130
3	7	158
4	9	166
5	28	170
6	8	171
7	11	174
8	43	176
9	25	177
9	2	177
10	4	185
11	42	187
12	47	194
13	51	195
14	1	196
15	48	197

Table 13 (Continued)

Questions Ranked by the Number of Correct Responses

Rank in Ascending Order	Number of the Question	Number of Correct Responses
15	17	197
16	37	198
16	46	198
17	19	199
17	12	199
18	44	201
19	18	202
20	35	205
21	23	211
22	52	212
23	33	213
23	10	213
24	32	214
25	15	215
26	45	216
26	49	216
26	13	216
27	36	217
28	39	219
28	40	219

Table 13 (Continued)

Questions Ranked by the Number of Correct Responses

Rank in Ascending Order	Number of the Question	Number of Correct Responses
29	38	221
29	5	221
29	3	221
30	6	222
31	30	223
31	50	223
32	31	223
33	26	224
34	21	225
34	16	225
34	34	225
35	22	226
36	24	227
37	20	228
37	14	228
38	29	229

The corresponding questions were placed in Appendix C. The fifteen most often missed questions revealed the following. Many graduates had forgotten (1) How often the regulations required the launching of the covered powered

survival craft, (2) The number of liferings required on each side of an offshore installation, (3) the range of Oxygen concentration that will hamper muscular coordination, (4) the period that an oxygen and explosion meter requires to give useful readings (5) the normal range of oxygen in the air, (6) how to keep a vessel headed into the oncoming seas, (7) the required number of thirty minute air packs, (8) the maximum list and trim of an installation that allows the launching of a survival craft, (9) which lifering buoys must have smoke flares attached, (10) how to warm victims of hypothermia, (11) the nature of the rig abandonment alarm (12) the required number of emergency position indicating radio beacons, (13) what to do in an overturned helicopter, and (14) how often to start the engines of a covered powered survival craft.

11. "How many graduates made their mistakes at each part of the launch during the re-tests?"

The supervisors returned the results of their re-testing for all 63 randomly selected graduates. The results of the re-testing were confirmed by telephoning these supervisors. The percent of initial mistakes made by the graduates at each step (See Appendix A) in the launching procedure was listed in table 14. Only steps one through six of the checklist dealt with launching the craft. Any of these six steps, if missed, would frustrate the launch. The rest of the items dealt with the retrieval of the craft. The results of steps one through six have

been recorded in table 14, but the results from the rest of the checklist have been omitted.

Table 14

The Percent of Initial Mistakes Made by Re-Tested Graduates at Each Step in the Launching Procedure, Number of Participants, and Mean Time for Launching

Step	Percent of Initial Mistakes	Rank
1	7.9	1
2*	NOT APPLICABLE	NOT APPLICABLE
3	1.6	3
4	4.8	2
5	7.9	1
6	0	4

* No standard time existed for launching during a drill. The mean time taken to launch was 2.37$\pm$.23 minutes at the 95 percent confidence level.

$\underline{N}$ = 63

12. "What percent of the graduates retained their abilities to launch a covered powered survival craft?"

Sixty-three randomly selected graduates were examined In this part of the investigation. Forty-nine graduates, seventy-seven and eight tenths percent, successfully launched their survival craft at least three months after the training. A successful launch was a launch that could

have allowed the graduate to escape his installation. Anyone correctly performing steps one through six was considered successful.

13. "The percent of the graduates who could launch a covered powered survival craft during the re-tests was the same as the percent of those who could launch a covered powered survival craft during the pre-tests."

This comparison involved the re-test scores from the sixty-three randomly selected graduates and the pre-test scores from those who were marked for retention.

Table 15

Difference in Proportions for the Pre-Test and Re-Test Scores, Numbers, Calculated z-Value, and Level of Significance

Item	Result
Difference in Proportions	0.599
Number Re-Tested	63.000
Number Post-Tested	301.000
Calculated Value of z	-9.588 *

* Significant at the .05 level

Seventy-seven and eight tenths percent of the graduates could launch during their re-tests. Seventeen and ninety-four hundredths percent of the graduates could launch during their pre-tests. A z-test was used to test the null hypothesis. Only the pre-test scores of those remaining

employed were used to determine the percentages used in the statistical comparison. The null hypothesis was rejected ($p<.05$) because the re-test percent was significantly higher than the pre-test percent.

To determine whether or not the passage of a period of time longer than three months significantly affected the results. The percent of successful launches during the re-tests of the graduates who had completed the course within the first six months of 1985 were compared to the percent of the successful launches of graduates who had completed the course after the first six months of 1985. No significant difference was calculated using a chi-square test ($p>.05$).

Table 16

Numbers of Re-Tested Graduates from the First Six Months of the Training Compared to the Numbers of the Graduates from the Latter Part of the Training Able to Launch Survival Craft, Calculated Value of x^2, and Level of Significance

Item	Initial Graduates	Subsequent Graduates
Launched	6	8
Failed to Launch	20	29
Totals	26	37

Calculated value of x^2 = .029236 NS

NS Not Significant at the .05 level

14. "The percent of the graduates who could launch a covered powered survival craft during the re-tests was the same as the percent of those who could launch a covered powered survival craft during the post-tests."

Seventy-seven and eight hundredths percent could launch during their re-tests. One hundred percent could launch during their post-tests. The null hypothesis was rejected.

Table 17

Difference in Proportions for the Re-Test and Post-Test Scores, Numbers, Calculated z-Value, and Level of Significance

Item	Result
Differences of the Proportions	0.22
Number Re-Tested	63.00
Number Post-Tested	301.00
Calculated Value of z	-8.34 *

* Significant at the .05 level

The change in proportions was significantly different.

15. "Was the cost per graduate below $750?"

The mean per capita cost per graduate of the course was $241. If the costs of travel and per diem expenses were excluded, then the per capita cost for the course was $71. The training department maintained detailed accounts of the costs for the students' housing, board, overhead,

transportation, instructors' salaries, equipment leases, and trainees' wages. These items were totaled and divided by the total number of participants to reach the mean per capita cost.

Chapter 5

INTERPRETATIONS, CONCLUSIONS, AND RECOMMENDATIONS

Important organizations had called for the development of a shore-based course to train offshore oilmen to launch their covered powered survival craft. Some of the important organizations subsequently called for safe the evaluation of this training. The purpose of this major applied research project was to safely evaluate the effectiveness of a novel course, Offshore Survival Systems Training. The major outcome to be evaluated was the increase in the frequency with which offshore personnel correctly launched the covered powered survival craft. To be directive of future steps to possibly improve the course, this evaluation incorporated the examination of additional, auxiliary outcomes.

Each outcome corresponded to an important research question that interested the audience for this evaluation. Each outcome was an issue that the audience needed determined. Accordingly, several pertinent research questions were answered by interpreting the results of this case study. From these various interpretations of the results, conclusions were then drawn. Finally, recommendations for the improvement of education, for the dissemination of the findings, and for the implementation of the recommendations were proposed.

Interpretations of the Results

The interpretations were the special meanings that the results had for the operation of the course, Offshore Survival Systems Training. Each interpretation of the results answered a particular research question in order to determine an issue that interested the audience for this evaluation. Consequently, the interpretations answered important and persistent questions about survival craft training.

Research Question One

It was determined that the percent of untrained personnel who were able to launch a covered powered survival craft did not increase during the period from January 1, 1984 to June 16, 1987. On theoretical grounds, the audience for this study had expected the ability of offshore personnel to remain constant if the personnel had remained without shore-based training. As anticipated, the company's percent of untrained personnel who could launch the covered powered survival craft remained the same over time. Statistically significant change had not occurred during the period. No spontaneous improvement in the skills of the untrained personnel had taken place. Even those marked for retention showed no improvement. The company's selection process for marking crewmen for retention did not raise the frequency of launching among those to be retained.

Research Question Two

The study revealed that the written pre-test scores did not increase over the period from January 1, 1984 to June 16, 1987. On theoretical grounds, the audience for this study had expected the knowledge of offshore personnel to remain fixed if the personnel had remained without shore-based training. As anticipated, the population of the company showed no significant change over time. An unanticipated finding involved those who were marked for retention. In the comparison, the late group scored worse on their pre-tests than the early group had. In the light of no improvement or of degradation of achievement in successive samples, a conservative assertion could be made. No spontaneous improvement in the knowledge of the untrained personnel had taken place. Furthermore, the least informed personnel were being marked for retention. This finding was unanticipated.

Research Question Three

An analysis of the data revealed that the course taught the crewmen much that they did not know about offshore survival. The mean of the differences between the pre-test and the post-test scores was 44.79 percent in favor of the post-test. Incidentally, the mean for the pre-test scores was 50 percent. The mean for the post-test scores was 95 percent. As expected, a large increase in the knowledge of the participants had occurred over the brief two-day training periods. The post-test mean of 95

percent described the condition of the graduates at the end of the course to the audience of this case study. The gain of 44.79 percent described the change the trainees had undergone to the audience of this case study.

Research Question Four

It was determined that, during the period from January 1, 1985 to June 30, 1987, Offshore Survival Systems Training did produce an increase in the percent of individuals who could launch the covered powered survival craft over the percent of individuals who could launch during the pre-tests. As expected, the increase in the percent of those who could launch their covered powered survival craft was large and statistically significant. The percent of untrained personnel who could launch was eleven and three-tenths percent. The percent of trained personnel who could launch was 100 percent. A large increase in the percent of the participants who could launch had occurred in a brief time. The post-test percent of those who could launch described the condition of the graduates of the course to the audience for this case study. The change of the percent who could launch their survival craft described the change the trainees had undergone to the audience of this case study.

Research Question Five

The data suggested that the provision of manuals coupled with the announcement of eventual training resulted

in an increase in the participants' knowledge of safety before these employees received formal training. Based on previous experience, a gain had been anticipated. As expected, the early announcement of formal training and the provision of manuals resulted in a statistically significant increase in the personnel's knowledge of marine survival. This finding supported the assertion that adult learners wanted to learn about vocationally relevant topics. Nevertheless, the audience should bear in mind the contingencies under which the improvement occurred.

Research Question Six

The data suggested that, during the period from January 1, 1985 to June 16, 1987, the announcement of eventual formal training along with the provision of manuals did not produce an increase in the launching pre-test scores. A previous library and quasi-experimental investigation had lead the training department to predict that adults would improve their performances before formal training. Contrary to expectations, the early announcement of formal training and the early provision of manuals did not result in a significant increase in the percent of successful launches before formal training.

Research Question Seven

It was determined that the graduates did take more knowledge of marine survival to the job than they did before the course. The personnel's knowledge was supposed

to influence them to train with the covered powered survival craft to maintain their launching skills. The literature on learning theory had lead the training department to anticipate only a mild decrease in achievement since it administered quarterly assignments to the graduates. Consequently, the training department anticipated a large mean of the differences between the pre-test and re-test scores. The mean of the differences in scores was 36.26 percent. This change described an important effect of the course to the audience of this case study.

Research Question Eight

It was determined that the mean of the differences between the written pre-test scores and the written re-test scores was still significantly different from zero. The mean of the differences in scores was 36.26 percent. Incidentally, the mean written pre-test score was 50. The mean written re-test score was 86.26. The literature had lead the training department to expect only a mild reduction in the scores of the graduates over time. As expected, the personnel retained significantly more information over a period of at least three months than they had known at the time of their pre-testing. The graduates took more knowledge of marine survival to the job than they had taken before the course. Their persistent gain in knowledge partly delineated the effectiveness of the course for the audience of the case study.

Research Question Nine

The data suggested that much of the personnel's learning had been transferred to the job. The literature had lead the training department to expect only a mild reduction in the scores of the graduates over time. As predicted by behavioral learning theory, the graduates as a whole did not maintain their knowledge of marine safety at the level of the post-test mean (95 percent). At least three months after their graduation, the mean re-test score was 86.2. This decrease was statistically significant, but it was not calamitous. The re-test score delineated the effectiveness of part of the course.

Research Question Ten

The case study determined which facts had been forgotten most often. The questions were marked in descending order of accumulated errors. The pertinent, missed questions in the written re-test asked: the frequency of launching required by federal regulations, the frequency of starting the motor of the craft, the signal ordering the abandonment of the installation, the maximum list and trim allowing launch, and the means to keep the craft headed into the seas. This case study uncovered specific weaknesses in the course. In no case did more than fifteen percent of the respondents miss any one question. These findings partly described the effectiveness of the course to the audience of this case study.

Research Question Eleven

It was determined how many graduates made their mistakes at each part of the launch during the re-tests. To improve the course, the audience of the case study needed to know at which steps in the launches the personnel were making the most mistakes. By correcting the most common problems first, the course could be improved quickly. Consequently, the findings were reported in descending order of percents. Seven and nine-tenths percent of the sample missed steps one and five; four and eight-tenths missed step four; one and six-tenths percent missed step three; and none missed step six. The personnel needed training to appear at the survival craft in their proper gear, to start their engines before lowering, and to lower the survival craft only after starting their engines. These remaining difficulties directed the attention of the audience of the case study to the most persistent errors found on the job.

Research Question Twelve

The study revealed that 77.8 percent of the graduates retained their abilities to launch a covered powered survival craft. The audience needed to know the effectiveness of the course at attaining its major outcome. This major outcome was the increase in the frequency of successful launches of survival craft. Seventy-seven and eight-tenths percent of the graduates could launch their covered powered survival craft at least three months after

their graduations. This finding helped describe the effectiveness of the course to the audience for this evaluation.

Research Question Thirteen

It was determined that the percent who could launch a covered powered survival craft during the re-tests was significantly greater than the percent found through the pre-tests. The literature had lead the training department to expect only a mild reduction in the frequency of successful launches over time. As anticipated, the percent of graduates who could still launch a covered powered survival craft three months or longer from their graduations was statistically greater than the percent of these same individuals who could launch before their training. An unanticipated finding indicated that the decline of launching skills might have leveled off after a period of six months. For those who had been graduated during the first six months of the course, the percent of successful launches was not statistically different from the percent of those who had taken the course after the first six months. The persistence of the gain in the percent of those who could launch delineated the effectiveness of the course.

Research Question Fourteen

It was determined that the percent who could launch a covered powered survival craft during the re-tests was

significantly less than the percent found through the post-tests. The training department had expected only a mild reduction in the frequency of successful launches over time. The percent of successful launches during the re-tests was significantly lower than the percent of successful launches during the post-tests. This decrease was statistically significant but not calamitous. Again, this finding delineated the effectiveness of the course for the audience of this case study.

Research Question Fifteen

The study revealed that the cost per graduate was below $750. The United States Coast Guard constituted an important part of the audience for this case study. It had estimated that the cost for survival craft and survival suit training should range between $120 and $750, with an average cost of $175, for each trainee. Its estimates excluded travel and per deim expenses. For the evaluated course, the per capita cost for each student's room, board, transportation, instructor's salary, equipment lease, overhead, and reimbursements was $241, $71 without travel and per diem expenses. This per capita expense was the cost for the instruction that resulted in a launching rate of seventy-eight percent, an increase of about seven times the original rate. Only half of the graduates were marked for retention during the prospective austere times. A return to the original number of employees would halve this rate to 38 percent, three times the initial launching rate.

Summary

The purpose of the investigation was to evaluate the effectiveness of a novel course, Offshore Survival Systems Training. During the period of the training effort, the company-wide percent of personnel who were untrained but who could launch their covered powered survival craft remained essentially the same, eleven and three-tenths percent. The mean written pre-test score for untrained personnel actually declined during this period. The course produced a quick, large increase in both the percent of those who could launch the covered powered survival craft and in the knowledge of the participants. Some trainees who had manuals available to them before attending the formal training had higher pre-test scores than those who did not. The provision of manuals before formal training did not increase the percent of those who could launch the covered powered survival craft during the pre-tests, although it did increase the trainees' knowledge of offshore survival. Many graduates retained a significant amount of skill and knowledge for at least three months after graduation. This skill showed no significant deterioration even eighteen months after graduation. Most significantly, seven times as many graduates still could launch their covered powered survival craft on the job as the number who could before training. Only half of the graduates had remained with the company by the time of this evaluation. The pertinent, missed questions in the written

re-test asked the frequency of launching required by federal regulations, the frequency of starting the motor of the craft, the signal ordering the abandonment of the installation, the maximum list and trim allowing launch, and the means to keep the craft headed into the seas. The most often missed steps in the launching procedure were steps one, four, and five. The personnel needed training to appear at the survival craft in their proper gear, to start their engines before lowering, and to lower the survival craft only after starting their engines. The mean time to board the survival craft from duty stations was 2.37 minutes.

Seventy-eight percent of the graduates could launch their covered powered survival craft during their re-tests. The cost per man for this outcome was $241 per graduate, or omitting travel and per diem expenses, $71 -- compared to the mean of $175 estimated by the United States Coast Guard.

Conclusions

The purpose of the investigation was to evaluate the effectiveness of a novel course, Offshore Survival Systems Training. The major outcome to be evaluated was the increase in the frequency with which offshore personnel correctly launched the covered powered survival craft. To be directive of future steps to possibly improve the course this evaluation incorporated the examination of

additional auxiliary outcomes. For each outcome, a research question was posed and answered. The meanings of these answers allowed the drawing of several judgments or inferences. These judgements or inferences constituted the conclusions of this study. These conclusions therefore determined issues for the audience for this study.

Research Question One

It was determined that the company's percent of untrained personnel who could launch the covered powered survival craft remained the same over time. Consequently, nothing was improving the company-wide launching skills of prospective trainees during the period of training. The rate of successful launching would have remained at eleven and three-tenths percent if no intervention had occurred. Yet, the audience for this report had recommended that every crewmember know how to launch his hard covered powered survival craft. Some outside intervention to improve the personnel's rate of successful launching was needed. Current company policies, governmental regulations, and industry practices produced a low frequency of launches.

Research Question Two

The study revealed that company-wide, nothing was increasing the personnel's knowledge of marine safety. The achievement level of the personnel needed some outside

intervention order to change. As the audience for this study had anticipated, company policies, governmental regulations, and industry practices were not producing personnel knowledgeable in marine survival. In fact, the company seemed to be selecting for retention those with the lowest achievement in knowledge of survival. The criteria for selecting those marked for retention needed reviewing.

Research Question Three

An analysis of the data revealed that the gain of knowledge among the participants of the course was large and statistically significant. A large increase in the knowledge of the participants had occurred over a brief two-day training period. Consequently, the course had resulted in a large, quick increase in the knowledge of the company's personnel. In the absence of any other obvious external influence that could have increased achievement over time, it was reasonable to assume that the course caused the increase in the personnel's mean achievement score. The course worked. The pre-test and post-test means provided measures for the monitoring of the crews' knowledge of survival. These measures and the procedures that produced them contributed to the creation of an initial evaluative model against which subsequent models could be compared. Providing such a model was itself a step in the improvement of education in the offshore oilfield. The data collected to this point, allowed the quantitative statement of the effectiveness of the course.

The literature had questioned the judiciousness of allowing instructors to usurp the training duties of the trainees' supervisors. According to the interpretations for this case study, the temporary assumption of training duties by instructors did not nullify the immediate, beneficial effects of the formal training.

Research Question Four

It was determined that the increase in the percent of those who could launch their covered powered survival craft was large and statistically significant. The percent of untrained personnel who could launch their covered powered survival craft was eleven and three-tenths percent. The percent of trained personnel who could launch was 100 percent. Consequently, the course had resulted in a large, quick increase in the percent of the company's personnel who could launch their covered powered survival craft. Without the shore-based course, the percent of crewmen who could launch their survival craft would have remained at an unsatisfactory eleven and three-tenths percent. In the absence of any other obvious external influence that could have increased performance over time, it is reasonable to assume that the course caused the increase in the personnel's percent of successful launches. The course did what it was supposed to do; it worked.

The pre-test and post-test performance data provided measures for the monitoring of the crews' readiness to launch their survival craft. The data collected to this

point, allowed the quantitative statement of the immediate effectiveness of the course. Furthermore, these measures combined with the procedure that produced them contributed to the creation of an initial evaluative model against which subsequent models could be compared. The provision of such a model was itself a step in the improvement of education in the offshore oilfield.

The literature had questioned the judiciousness of allowing instructors to usurp the training duties of the trainees' supervisors. According to the interpretations for this case study, the temporary assumption of training duties by instructors did not nullify the immediate, beneficial effects of the formal training.

Research Question Five

The data suggested that some personnel who had manuals for the course independently studied marine survival before they were formally trained. The early announcement of formal training and the early provision of manuals resulted in a statistically significant increase in the personnel's knowledge of marine safety. Given the opportunity, offshore personnel studied the printed manuals on their own under the contingency of announced, eventual, formal training.

The case study supported the usefulness of the early announcement of formal training and the early issuing of manuals to the prospective trainees. The personnel's anticipation of shore-based, formal training resulted in

their learning while offshore. This was a link between on-shore and off-shore training efforts. The prospect of formal training under the correct contingencies was associated with quick, moderate gains in the knowledge of offshore personnel.

Research Question Six

The data suggested that the early announcement of formal training and the early provision of manuals did not result in a statistically significant increase in the percent of personnel who could launch their covered powered survival craft. Consequently, the provision of marine safety information did not result in the personnel's training with their covered powered survival craft before formal training. Perhaps, the personnel lacked discretionary access to their survival craft. The lack of discretionary access to the craft could have inhibited their independent learning of skills before formal training. This possibility was consonant with the complaint about supervisors neglecting survival training, that had been found in the literature.

Research Question Seven

The graduates knew more about marine survival at least three months after the course than they did before the course. The mean re-test score was approximately 70 percent higher than the mean pre-test score. This was the result for those still employed during the re-tests.

Research Question Eight

It was determined that the graduates retained significantly more information after a period of at least three months than they did at the time of their pre-testing. Their gain delineated the long-term effectiveness of the course. The literature had questioned the judiciousness of allowing instructors to usurp the instructional duties of the trainees' supervisors. According to the interpretations for this case study, the temporary assumption of training duties by instructors did not nullify the long-term, beneficial effects of the formal training. The course did what it was supposed to do; it worked. A possible reason for its success was its involvement of the supervisors as the educators of their own crews through the quarterly assignments.

The written pre-test and re-test means provided measures for the monitoring of the crews' knowledge of offshore survival. The data collected to this point, allowed the quantitative statement of the effectiveness of the course. Furthermore, these measures contributed to the creation of an initial evaluative model against which subsequent models could be compared. The provision of such a model was itself a step in the improvement of education in the offshore oilfield.

Research Question Nine

The data suggested that the offshore personnel did not maintain their knowledge of marine safety at the level of

the post-test mean because some of the graduates had not studied marine survival during this period. Such a decrease meant that the personnel's written quarterly assignments alone did not convince everyone offshore to study marine survival.

Research Question Ten

Based on the findings, the pertinent, forgotten items on the written re-test asked the frequency of launching required by federal regulations, the frequency of starting the motor of the craft, the signal ordering the abandonment of the installation, the maximum list and trim allowing launch, and the means to keep the craft headed into the seas. The topics corresponding to the missed questions should be emphasized during the course and addressed in the quarterly assignments. This case study uncovered specific weaknesses of the course.

Research Question Eleven

The results indicated which steps in the launching procedure still needed attention. The results were reported in descending order. Seven and nine-tenths percent of the sample missed steps one and five; four and eight-tenths missed step four; one and six-tenths percent missed step three; and none missed step six. The personnel needed training to appear at the survival craft in their proper gear, to start their engines before lowering, and to lower the survival craft only after starting their engines.

This case study uncovered specific weaknesses of the course. Supervisors on offshore installations needed to receive both the results of the evaluations and the management's instructions to address these most often missed steps.

Research Question Twelve

The study revealed that 77.8 percent of the graduates could launch their covered powered survival craft at least three months after their graduation. This was a large increase over the percent who could originally launch their covered powered escape craft.

Research Question Thirteen

It was determined that the percent of graduates who could still launch a covered powered survival craft three months or longer from their graduations was statistically greater than the percent of these same individuals who could launch before their training. For those who had been away from the course for eighteen months or longer, the percent of successful launches was not statistically different from those who had been away from the course for three months to eighteen months. The course had produced a long-lasting significant increase in the percent of the retained crewmen who could launch their survival craft. So long as the company's policy for selecting those whom it intended to employ remained the same or improved, the percent of those retaining their launching skills could be

considered stabilized at seventy-eight percent. The course did what it was supposed to do; it worked.

The pre-test, post-test, and re-test performance data provided measures for the monitoring of the crews' readiness to launch the survival craft. The data collected to this point, allowed the quantitative statement of the effectiveness of the course. Furthermore, these measures contributed to the creation of an initial evaluative model against which subsequent models may be compared. The provision of such a model was itself a step in the improvement of education in the offshore oilfield. Additionally, it demonstrated the feasibility of safely evaluating a course on offshore survival craft training.

The literature had questioned the judiciousness of allowing instructors to usurp the training duties of the trainees' supervisors. According to the interpretations for this case study, the temporary assumption of training duties by instructors did not nullify the long-term, beneficial effects of the formal training.

Research Question Fourteen

It was determined that the percent of successful launches during the re-tests was lower than the percent of successful launches during the post-tests. For some reason the percent of those who could launch their covered powered survival craft had declined. Consequently, the course had induced an increase in the frequency of survival, practice drills that were held offshore, but not everyone practiced.

Some crewmen did not maintain adequate skills, so these crewmen needed some intervention from the outside. The sending of printed study materials and written assignments offshore did not maintain the launch rate at post-test levels. The literature had revealed that sufficient training with survival craft often failed to occur because the supervisor had not led his crew to training. The reduction in the percent of launches during the re-test from the pre-test level implied that a few supervisors still did not attend to training drills.

Despite the effectiveness of the course, a refresher course or a supplemental course was needed. Based on the cost of the evaluated course, the expense of repeated refresher courses for everyone seemed prohibitive, but a supplemental course for supervisors appeared affordable. A goal of the supplemental course was to teach offshore supervisors how to train their subordinates in the use of the covered powered survival craft on their installations and to evaluate the training.

Research Question Fifteen

An analysis of the financial data revealed that the per capita cost for the course was $241, or omitting travel and per diem expenses, $71. This was the cost to deliver the instruction that resulted in a launching rate of seventy-eight percent, an increase of about seven times the original rate. Only half of the graduates remained in the pool of individuals to be employed during the prospective

austere times. A return to the original number of employees would halve this rate to thirty-eight percent. This rate was about three times the original rate of launching. This cost was well below the mean cost estimated by the United States Coast Guard. The United States Coast Guard considered their mean cost to be an insignificant amount. This course should be continued.

Summary

The purpose of the investigation was to evaluate the effectiveness of a novel course, Offshore Survival Systems Training. Before formal training, some personnel on offshore drilling rigs who had manuals for the course independently studied marine survival. Without the shore-based course, the percent of crewmen who could launch their covered powered survival craft would have remained at an unsatisfactory eleven and three-tenths percent. The mean written pre-test score for individuals marked for retention actually declined during this period. The criteria for identifying the individuals to be marked for retention with the company should be reviewed.

The two days of training for each crewman induced large gains in the crews' skills and knowledge. Immediately after formal training, everyone could launch his craft. The course produced significant, long lasting improvement in the crewmen's skill in launching survival craft and their knowledge of marine survival. At least three months after the training, the ratio of personnel who

still could launch their craft was seventy-eight percent. The difference in the percents of those who could launch after a period of eighteen months or longer and of those who could launch after a period of three to eighteen months was not statistically significant. Nevertheless, both the skills and the knowledge of some of the trained personnel had deteriorated. Some crewmen did not maintain adequate skills, so these crewmen needed intervention from some outside source to maintain their proficiencies. Sending study materials offshore quarterly did not suffice to induce their independent training with their covered powered survival craft. The cost of the training effort was $241 per graduate, or omitting travel and per diem expenses, $71.

Despite the effectiveness of the course, a refresher course or a supplemental course was needed. Based on the cost of the evaluated course, the expense of repeated refresher courses for everyone seemed prohibitive, but a supplemental course for supervisors appeared affordable. A goal of the supplemental course was to teach offshore supervisors how to train their subordinates in the use of the covered powered survival craft on their installations and to evaluate the training.

Several organizations should receive this case study because they form its audience. These organizations are the International Association of Drilling Contractors, the American Petroleum Institute, the United States Coast

Guard by way of the Officer in Charge Marine Inspection and the Commandant, and the Offshore Survival Training Steering Subcommittee of the University of Southwestern Louisiana. The heads of these organization should receive copies of the case study. The case study should also be disseminated throughout the sponsoring company, especially to the company's sales and risk management departments. Through these channels, the results of the evaluation should also reach the clients of the company. Thereby, the interested audiences can benefit from the evaluation of the course, Offshore Survival Systems Training.

Recommendations for the Improvement of Practice, Including Strategies for Diffusion Implementation and Improvement

The conclusions were judgments or inferences about the research questions. Singly or in combination, these conclusions suggested the recommendations regarding important aspects of the course.

1. The company was advised that some intervention from outside the offshore installations was necessary to increase the frequency of successful launches.

2. The company was advised that some intervention from outside the offshore installations was necessary to increase the personnel's knowledge of offshore survival. The company was further urged to reexamine the guidelines that it used to select the personnel that it marked for retention.

3. Offshore Survival Systems Training was recommended to increase the newly hired personnel's knowledge of offshore survival.

4. Offshore Survival Systems Training was recommended to teach the company's newly hired personnel how to launch their covered powered survival craft.

5. The company was advised to distribute training manuals to each offshore installation and to announce its personnel's required attendance at formal training, at least two personnel rotations before the class date.

6. The company was advised not to depend on the issuance of printed material and written assignments to initiate independent skill development among the offshore personnel.

7. The course and the quarterly written assignments were endorsed to raise the personnel's knowledge of marine survival.

8. All new personnel should complete the course, Offshore Survival Systems Training, and the quarterly written assignments. It was recommended that the course and the quarterly assignments be retained.

9. All new personnel should complete the course, and the quarterly written assignments. The personnel's ability to launch a covered powered survival craft should be assessed every three months. The results of the assessments should be used to evaluate the continued effectiveness of the course. Either a new course should be

developed to teach supervisors how to train and evaluate their personnel, or a refresher course should be completed by those who could not launch their survival craft during the re-tests.

10. The topics corresponding to the missed questions should be emphasized and the trainees' learning examined an additional time during the course. These topics should be included in the quarterly assignments.

11. The personnel should have training to appear at the survival craft in their proper gear, they should have training to start their engines before lowering, and the should have training to lower the survival craft only after starting their engines. It was recommended that the course include additional practice involving the missed steps. It was recommended that the quarterly assignments include a launching checklist on which the supervisors could check the launching behaviors of his subordinates.

12. All newly hired personnel should complete the course, Offshore Survival Systems Training, and the quarterly written assignments. The personnel's ability to launch a covered powered survival craft should be assessed every three months. The results of the assessments should be used to evaluate the continued effectiveness of the course. Either a new course should be developed to teach supervisors how to train and evaluate their personnel, or a refresher course should be completed by those who could not launch their survival craft during the re-tests.

13. All newly hired personnel should complete the course and the quarterly written assignments. The personnel's ability to launch a covered powered survival craft should be assessed every three months. The results of the assessments should be used to evaluate the continued effectiveness of the course. Either a new course should be developed to teach supervisors how to train and evaluate their personnel, or a refresher course should be completed by those who could not launch their survival craft.

14. It was recommended that all new personnel complete the course, Offshore Survival Systems Training, and the quarterly written assignments. The personnel's ability to launch a covered powered survival craft should be assessed every three months. The results of the assessments should be used to evaluate the continued effectiveness of the course. Either a new course should be developed to teach supervisors how to train and evaluate their personnel, or a refresher course should be completed by those who could not launch their survival craft during the re-tests. Finally, if the selection criteria for marking personnel for retention could select high rather than low achievers, then the company might maintain a frequency of successful launches higher than 77.8 percent.

15. It was recommended that the company train its new personnel through the course, Offshore Survival Systems Training. The results addressed in research questions one through fourteen were the returns to the company for the

investment of $241 per trainee. At about this same per capita cost, a second course should be developed for supervisors to teach them how to train and evaluate their men on offshore locations. Alternatively, Offshore Survival Systems Training should be used to recycle those graduates who are found unable to launch their survival craft offshore during the re-tests.

Summary

The purpose of the investigation was to evaluate the effectiveness of a novel course, Offshore Survival Systems Training. Before formal training, some personnel on offshore drilling rigs who had manuals for the course independently studied marine survival. Accordingly, Manuals should be provided and the course should be announced at least two personnel rotations before the class date.

Without the shore-based course, the percent of crewmen who could launch their covered powered survival craft would have remained at an unsatisfactory eleven and three-tenths percent. The mean written pre-test score actually declined during this period. Test scores should be included in the criteria for identifying the individuals to be marked for retention. Additionally, the criteria for marking personnel to be retained should be reviewed. The two days of training for each crewman induced large gains in the crews' skill and in knowledge. Immediately after formal training, everyone could launch his craft. All newly hired

personnel should attend the course. The course produced significant, long lasting improvement in the crewmen's skill in launching survival craft and their knowledge of marine survival.

At least three months after the training, the ratio of personnel who still could launch their craft was seventy-eight percent. The mean time to board the survival craft from duty stations was 2.37 minutes. The difference in the percents of those who could launch after a period of three to eighteen months and of those who could launch after a period of eighteen months or longer was not statistically significant. Accordingly, the course and the quarterly assignments should be maintained. Nevertheless, both the skills and the knowledge of some of the trained personnel had deteriorated. Some crewmen did not maintain adequate skills, so these crewmen needed intervention from some outside source to maintain their proficiencies. Sending study materials offshore quarterly did not suffice to induce everyone's training with their covered powered survival craft. The cost of the training effort was $241 per graduate, or omitting travel and per diem expenses, $71.

Despite the effectiveness of the course, a refresher course or a supplemental course was needed. The topics corresponding to the missed questions should be emphasized during the course and asked as part of the quarterly assignments. In addition, the quarterly assignments should

include a launching checklist on which the supervisors could check the launching behaviors of their subordinates. Based on the cost for the evaluated course, the expenses of repeated refresher courses for everyone seemed prohibitive, but a supplemental course for supervisors appeared affordable. A goal of the supplemental course was to teach offshore supervisors how to train their subordinates in the use of the covered powered survival craft on their installations and to evaluate the training. The Department of Transportation should require the provision of feedback from offshore installations to be part of any course that satisfies the lifeboat training requirement for Offshore Installation Manager, Barge Supervisor, or Ballast Control Officer. The above are the recommendations for the improvement of marine survival education.

The results and conclusions of this evaluation should be disseminated among several organizations. These organizations are the International Association of Drilling Contractors, the American Petroleum Institute, the Offshore Survival Training Steering Subcommittee of the University of Southwestern Louisiana, and the United States Coast Guard by way of Officer in Charge Marine Inspection and the Commandant. The results also should be disseminated throughout the company, especially to the company's sales and risk management departments. Through these channels, the results of the evaluation should also reach the clients of the company.

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APPENDIX A

INSTRUCTIONS FOR THE PERFORMANCE RE-TEST

DIAMOND M COMPANY

POST OFFICE BOX 1089 • MORGAN CITY, LOUISIANA 70381 • TELEPHONE (504) 384-3540

DATE: September 14, 1987

FROM: Thomas P. Carlile TPC

TO: Barge Captains

SUBJECT: Launching of Covered Powered Survival Craft

The Training Department has selected the men at the bottom of this letter at random to survey. Individually ask each of these men to act as though he had heard the signal to abandon his rig. At the lifeboat, ask him how to launch the craft. He may tell you or show you how to do it. If you do not want him to actually launch the craft, have him go through the motions of a launch . The Training Department wants to know where its graduates make their first mistakes during an abandonment drill. Complete the attached training practice sheets and return them to the Training Department by the date on the top of the sheet. An example sheet is attached. Call the Morgan City Training Department if you have any questions.

Outside organizations expect Diamond M Company to evaluate its training. Exxon, for example, intends to influence its drilling contractors, the Coast Guard, The American Petroleum Institute, The International Association of Drilling Contractors, and everybody else to evaluate their training. The Diamond M Training Department is eager to evaluate its training to discover what needs to be done next. Complete the attached sheets and return them to the Training Department by the date on the top of the training practice sheet.

Attachments

FZ/dmr

XC: Roger Cumba

TRAINING PRACTICE
OFFSHORE SURVIVAL SYSTEMS TRAINING II

RETURN TO THE TRAINING DEPARTMENT BY _____

SUPERVISOR _____

WRITE A "NO" IN THE BOX CORRESPONDING TO THE MAN'S FIRST ERROR. WRITE A "YES" IF HE DID WELL.

		COVERED POWERED SURVIVAL CRAFT										SURVIVAL SUIT		FIRE DRILL	
		LIFE VEST + HARD HAT	RESPONSE TIME + MUSTER	CORRECT START ENGINE	LOWERED	ENGAGED	SENT FORWARD OR REVERSE	REPLACED HOOK	CHECKED CABLES	RESET CONTROLS	ORDERS CLEAR	DONNING TIME	RESPONSE TIME	PROPERLY EQUIPPED MEN	
SCORE															
DATE															
TRAINER															
TRAINEE															
SCORE															
DATE															
TRAINER															
TRAINEE															
SCORE															
DATE															
TRAINER															
TRAINEE															

IF YOU HAVE ANY QUESTIONS ABOUT WHAT THESE BLOCKS MEAN, LOOK AT THE LAUNCHING INSTRUCTIONS ON YOUR CRAFT.

APPENDIX B

INSTRUCTIONS FOR THE WRITTEN RE-TEST

SUPPLEMENTARY STUDY PROGRAM - SEPTEMBER 1987

TO: Rig Superintendents

FROM: Training Department

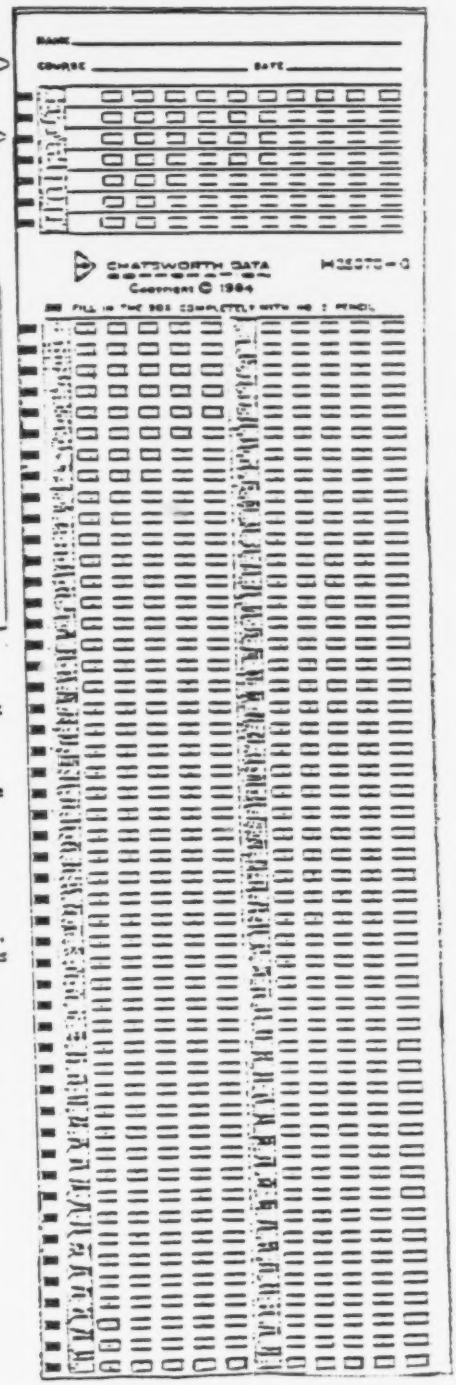
DATE: September 15, 1987

SUBJECT: Evaluation of OSST - IMPORTANT

Its time to see what our OSST graduates still remember from their classes.

1. Please test all of your OSST graduates. Your hands may not work together to answer these questions.
2. Ask them to answer the OSST questions on the red cards.
3. They need to write their name, rig number, course, and date at the top of the cards in pencil.
4. Skip the student number section.
5. Give your hands as much time as they need to answer the questions, but tell them, "Don't waste time. If you don't know an answer, mark 'E' and go to the next question."
6. Their answers will be used to see how OSST is doing. Kindly supervise the testing until the last man turns in his questions and answer card.
7. Return both the questions and the red answer cards to the training center.
8. If you split the testing among several groups, make sure each group cannot give the questions to another group ahead of time.

Please remind your Barge Captains about the launching tests for OSST, this will also help us evaluate the course.



APPENDIX C

WRITTEN RE-TEST

OFFSHORE SURVIVAL SYSTEMS TRAINING

SUPPLEMENTARY STUDY PROGRAM

1. In an emergency, you should care for a person who has had prolonged exposure to the cold. To do so

   a. give him hot coffee and liquor
   b. vigorously rub him all over to start his circulation
   c. gently warm him
   d. rub his frozen extremities with snow or ice

2. If a victim of exposure is breathing, and if you can put him into a tub of warm water (102 F - 105 F), then

   a. warm him all over in the tub, especially his arms and legs
   b. always wrap him in dry blankets only
   c. warm his trunk under the water
   d. chase him around the room with ice cubes

3. While in cold water and while wearing a flotation device, you should

   a. swim to keep warm
   b. huddle to retain your heat
   c. sing and clap to raise your spirits
   d. alternate between swimming and huddle

4. The alarm for abandonment of your rig is

   a. the continuous sounding of the general alarm
   b. sounding of the general alarm three times then the whistle three times
   c. ringing of the bells and the intermittent ringing of the general alarm bells and the sounding of the whistle for longer than ten seconds
   d. continuous ringing of the general alarm and the sounding of the whistle

5. The signal for "all clear" is the

   a. continuous sounding of the general alarm
   b. sounding of the general alarm three times then the whistle three times
   c. ringing of the bells and the intermittent ringing of the general alarm bells and the sounding of the whistle for longer than ten seconds
   d. continuous ringing of the general alarm and the sounding of the whistle

6. The alarm for fire is

   a. the continuous sounding of the general alarm
   b. sounding of the general alarm three times then the whistle three times
   c. ringing of the bells and the intermittent ringing of the general alarm bells and the sounding of the whistle for longer than ten seconds
   d. continuous ringing of the general alarm and the sounding of the whistle

7. Muscular work becomes difficult

   a. after methane poisons you at the LFL
   b. if the percent of oxygen drops to 12% or below
   c. if the percent of oxygen rises above 25%
   d. all of the above

8. The percent of oxygen in the air should be between

   a. 19.5% and up
   b. 19.5% and 25%
   c. 19.5% and below
   d. 25% and 100%

9. The meter will give you useful readings if you leave it ___ in the space that you want to test

   a 5 seconds
   b. 20 seconds
   c. 10 seconds
   d. 1 second

10. "LFL" means

   a. the lowest temperature that will set a gas on fire
   b. the lightest density of humidity
   c. the least percent of flammable gas needed to burst into flame
   d. the percent amount of oxygen needed to flame

11. The Mobile Offshore Rig Regulations intend that each rig must have a self-contained breathing apparatus to be used as protection from

   a. carbon dioxide
   b. smoke or gas leaking from a refrigeration unit
   c. halide fire extinguishers
   d. any gas leaking from any compressor

12. With this 30 minute air pack, the user can walk right off the rig floor and into an area filled with ammonia gas from a leaky cooler,

    a. fearlessly
    b. carefully watching the fit of his mask and his remaining air pressure
    c. tied by a line to his co-workers
    d. never

13. The duration of the air flow for a 30 minute air pack depends on

    a. the rate of work done by the user
    b. the amount of the users excitement
    c. the atmospheric pressure
    d. all of the above

14. One can use a 30 minute air pack if he has

    a. long sideburns
    b. a skull cap that projects under the face plate
    c. glassed
    d. none of the above

15. An overturned escape capsule should

    a. always stay overturned
    b. run in reverse
    c. always right itself
    d. right itself if the occupants have strapped themselves in with seatbelts; unless it is a CA2801, 9091, or a 9089

16. If you must abandon your rig quickly but safely, then the safest equipment to use is

    a. the escape capsule
    b. the inflatable fife vest
    c. the survival suit
    d. the flotation ring

17. Someone must start the engine of your capsule

    a while on the way to the surface of the water
    b. after strapping in but before starting his descent
    c. after you have reached the water and released your cable
    d. when the drift of the capsule tells you the direction of the current

18. Unless the seas prevent it, you should launch and steer the capsule (according to its manufacturers)

    a. every week
    b. every fourteen days
    c. every month
    d. twice a year

19. Your capsule can run ___ hours on its tank of fuel

    a. half
    b. eight
    c. twelve
    d. twenty-four

20. You should start the engine of your capsule at least

    a. every week
    b. every fourteen days
    c. every month
    d. twice a year

21. To tow your capsule from a rescue boat you must

    a. secure line from the rescue boat to your capsule's release hook only
    b. tie the tow line from the boat to your towing bridle and only to this bridle
    c. secure a line from the rescue boat to the bottom of your capsule
    d. tie the tow line around your own waist and stand near one of the forward doors

22. To hoist your capsule or covered lifeboat

    a. pull it up immediately when it cable(s) have been attached
    b. check the pendant cables, then pull it up immediately
    c. check that the cables and grooves line up, and the craft is straight beneath the winch
    d. wait for eight to twelve foot seas so the swells will help lift the craft to its davits

23. To tow your capsule

    a. travel at five knots or fewer in moderate seas
    b. avoid severe storms
    c. tie the tow line to the towing bridle
    d. all of the above

24. In rough seas, the transfer of personnel from your capsule or covered life boat is

    a. to be avoided
    b. moderately difficult
    c. easy
    d.. of no concern to anyone

25. The lifeboats must be launchable even when the rig has minimum draft and up to

    a. 15 degree list or 10 degree trim
    b. 10 degree list or 15 degree trim
    c. 25 degree list or 15 degree trim
    d. all of the above

26. Empty and refill the fuel tank at least every

    a. three months
    b. year
    c. two months
    d. week

27. According the mobile offshore drilling unit regulations, lower each lifeboat to the water at least once every

    a. month
    b. two months
    c. three months
    d. week

28. To always head into the waves, you

    a. can only row into the waves
    b. must have lost your mind
    c. usually depend on the sea anchor
    d. always need power from an engine

29. To tow a raft

    a. tow it fast as the motor can tow it
    b. attach the tow rope to the top of the raft
    c. tie a line to the canvas cover
    d. tie a line to the towing bridle

30. Patch underwater leaks with

    a. a cold patch
    b. neoprene cement
    c. sealing clamp
    d. Elmers glue

31. Throw smoke signals

    a. to the windward side of the boat
    b. to the leeward side of the boat
    c. away from the boat in any direction
    d. astern

32. To manually launch a life raft - right away -

a. split the restraining bands
b. read the instructions while you launch it
c. grab it and jump into the water with it
d. hit the hydrostatic release button, and throw the raft overboard

33. In 35 F water, a man with a survival suit can survive

a. thirty minutes
b. thirteen hours
c. four hours
d. five hours

34. Without a survival suit, a man can survive in 35 F water for

a. thirty minutes
b. thirteen hours
c. four hours
d. five hours

35. A survival suit will fit anyone up to this height and weight

a. 6 feet 300 pounds
b. 6 feet 8 inches and 280 pounds
c. 8 feet 6 inches and 280 pounds
d. any size

36. The technique of abandoning your rig, called the fireman's drop, is

a. safe
b. no better than any other dive
c. worse than diving head first
d. dangerous

37. Life jackets have a self-righting moment that will right its wearer

a. and always keep him safe until help arrives
b. and let him breath if he faces correctly
c. and allow him to swim forwards
d. and keep him alive until help comes

38. Life jackets and work vests

a. may be used whenever some personal flotation device is needed
b. do the same job
c. must be stored separately
d. may be stored together

39. If you are ever immersed in seawater of 60 F, and you are far from help, but you do have on a life jacket, then your should

    a. swim to build up your body heat
    b. huddle
    c. sing and clap your hands
    d. practice your drown proofing techniques

40. Each mobile offshore drilling unit must have

    a. enough preservers for 100% of the persons allowed on board
    b. enough life preservers for 125% of the persons allowed on board
    c. enough life preservers for 75% of the persons allowed on board
    d. enough life preservers for 150% of the persons allowed on board

41. Each manned platform must have at least

    a. 1 ring life buoy on each side of the platform
    b. 2 ring life buoys on each side of the platform
    c. 1 ring life buoy to leeward and 1 to windward
    d. 1 ring life buoy for each man overboard the rig

42. Each rig must have 2 ring life buoys

    a. next to each life boat
    b. releasable from the bridge or position uauthorized by the OCMI
    c. on each deck
    d. available for every man on the drill floor

43. Each MODU should have 1 ring life buoy on each of its sides, attached to

    a. a buoyant line 90 feet long or 11/2 times the distance from this buoy to the waterline, whichever i greater, and attached to the rig
    b. a 3 to 6 foot line attached to the rig
    c. a buoyant line 90 feet long or 11/2 times the distance of this buoy to the water line, whichever is greater
    d. at least 9 buoys with 90 foot lines attached

44. Test the line throwing gun

    a. by firing it, with a service line attached, every month
    b. by firing it, with or without a service line attached, every four months
    c. by visually inspecting it for corrosion or dents
    d. by testing it underwater for leaks

45. The mobile offshore drilling unit regulations state that the master or person in charge shall instruct ____

    a. the toolpusher
    b. the toolpusher and driller
    c. personnel
    d. one other person aboard

46. Each rig not on an international voyage must carry

a. only an impulse projected rocket type line throwing appliance
b. only a shoulder type line throwing gun
c. either a rocket type appliance or a line throwing gun
d. none of the above

47. Each self propelled unit must have at least

a. two EPIRB units
b. one EPIRB unit
c. three EPIRB units
d. five EPIRB units

48. The EPIRB unit works

a. automatically
b. normally, so don't touch it
c. both a and b are true
d. only if you say, "please"

49. To test the EPRIB unit

a. push the test switch with the beacon upside down, then turn it upright
b. turn it upright, and then push the button
c. spin it once around its meridian and listen to 243MHZ on your radio
d. turn it upside down and listen to station 121.5MHZ

50. Your EPIRB unit should be installed

a. sideways
b. upside down
c. rightside up
d. any which way

51. If your helicopter has just overturned in six to eight foot seas, you should

a. open the door and swim away from the craft
b. hold your breath and wait until it reaches the ocean floor
c. reach for supports that you know about in the helicopter
d. open its doors, get your bearing, and swim away from it

52. In warm water, you can hold your breath for

a. 2 seconds
b. 15 seconds
c. 30 seconds
d. 60 seconds

BIOGRAPHICAL SKETCH OF THE PARTICIPANT

BIOGRAPHICAL SKETCH OF PARTICIPANT

FRANCO ZAMBON

Educational Institutions Attended and Degrees Earned:

Fall 1981 to present
Ed.D. student, NOVA University. Graduation expected in September, 1988.

1982 to present
Certified as an Operator's Representative by the LSU Well Control School and subsequently by the Training Department of Diamond M Company. Accepted by the MMS as an instructor of well control. "Approved " By the United States Coast Guard to teach Offshore Survival Systems Training, Offshore Survival Systems Training for Supervisors, and Stability for Mobile Offshore Drilling Units.

1978
Ph.D. California Coast University (state approved). Psychology.

1977
M.A. Goddard College. Psychology.

1971
B.S. Louisiana State University in New Orleans. Mathematics education, English, physics, and general science.

Professional Positions Held:

July 27, 1988 to Present
Instructor in Mobile Offshore Drilling Unit Stability, Well Control, and Offshore Survival for the University of Southwestern Louisiana, Continuing Education Division.

September 1984 to July 27, 1988
Instructional designer and Training Coordinator for Diamond M Drilling Company. (1) in 1984, I designed the only, currently, United States Coast Guard approved marine survival program required for the licensure of owners and operators of mobile offshore drilling units. (2) In 1985, I negotiated with the United States Coast Guard to acquire the status of "approved" for this course, osst. (3) In the same year, I negotiated for the cooperation of two accredited colleges to grant successful trainees college credit for each course of the training department. (4) I subsequently evaluated the survival course. The

evaluation lead to improved measures of performance for offshore crews. It also lead to the design and development of another course, Offshore Survival Systems Training for Supervisors. This new course caused additionally improved performance among offshore personnel. (5) In 1984 I installed a computer assisted office management system, and trained personnel in its use and operation. (6) In 1985 I developed computer assisted instruction for Able Bodied Seaman's examination preparation. (7) In 1985 I also assisted in the formation of the portion of the Crane Operators' Training Course called "Leadership." (8) Throughout this period, I completed these and other special projects, each requiring the engineering of cooperation within and outside of the company, and each done at least 50 percent below budget and in at most half of the projected time. (9) Finally, I lead the improvement of each course taught at the training center of Diamond M Company. In 1986 I lead the training department in the rewriting of the company's well control manual and in the restructuring of its well control course. In 1987 I lead the efforts of a team of two engineers to completely revise the company's mobile offshore drilling unit stability course. This included my abstracting pertinent objectives from numerous, experienced authorities, and my composing specific objectives for the course. Subsequently, I wrote the successful application for Coast Guard approval of the course.

July 1984 to August 1984
Consultant for Center For Computer Education. In this period, I designed and helped present a week-long course on micro computers for educators. This course carried three hours of undergraduate credit.

March 1, 1984 to June 2, 1984
Mathematics teacher for Orleans Parish School Board. Taught advanced mathematics, algebra for gifted freshmen, and pre algebra for poorly prepared pupils of various ages.

July 1983 to March 1, 1984
Assistant to Mr. Dennis Zambon of Custom Pools by Dennis Zambon.

July 1983 to August 1983
Consultant for Center For Computer Education. I designed and helped present a week-long course on micro computers for educators. This course carried three hours of undergraduate credit.

March 1982 to May 1983
Instructor and instructional designer for Pool Offshore Company, Inc. (1) During this period, I gathered and

arranged information to be learned according to the requirements of various departments of the company and the learning styles of the employees. (2) I designed and helped present a course on the Operation and Maintenance of Hydraulic Offshore Cranes. (3) I designed and helped present a completely revised basic course on blowout prevention. (4) I helped design and produce a well control mathematics course for rig hands (cassette and workbook). (5) I designed and presented a refresher course on trigonometry for draftsmen.

May 1981 to March 1982
Instructor for Delta School of Business. In this period I taught business courses: mathematics and English. I also performed a needs assessment and acted upon its results. Subsequently, the rate of absenteeism dropped from 85% to 15%.

Published Material:

"The eight Processes of Creativity." National/State Leadership Training Institute on the Gifted and Talented, June 1979.

"Emergency Preparedness Training." (Address made to the International Association of Drilling Contractors) Dallas, Texas, July 23, 1985.

"Making Training a Rewarding Experience." (Address made to the International Association of Drilling Contractors) Denver, Colorado, June 9, 1986.

Making Training a Rewarding Experience. Eric ED 271 595, 1986.

"Diamond M Sets Up Marine Survival Course" Drilling Contractor. June/July 1986.

A Comparison of Pre Test Means from Oil Field Workers Having Available Manuals and Those Lacking Manuals Before Announced Training. Eric ED 283 047, 1987.

Courses Taught:

Blow Out Prevention, Mineral Management Service Certified
Offshore Survival Systems Training, United States Coast Guard approved
Offshore Survival Systems Training for Supervisors, United States Coast Guard approved
Stability (Naval), United States Coast Guard approved
Operation and Maintenance of Offshore Hydraulic Cranes
Trigonometry for Draftsmen
Business Statistics, Our Lady of Holy Cross College (OLHCC)

Introduction to Computers, OLHCC
Elementary and Secondary Educational Software, OLHCC
First and Second Semester Statistics, OLHCC
Introduction to Psychology, OLHCC
First Semester Mathematics, OLHCC
Abnormal Psychology, OLHCC